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DOCUMENT-IDENTIFIER: US 6704489 B1
TITLE: Resource management system and digital video reproducing/recording apparatus

Abstract Text (1):
A resource management system is composed of a plurality of application programs, a resource management information database, and a resource manager. Each application program executes data transfer using resources. The resource management database stores resource management information and key information for each resource. Upon receipt of a resource use request from an application program, the resource manager judges whether the requested resource can be allocated to the application program by referring to the resource capacity and the currently-allocated volume of the resource that are included in the information database. If judging that the requested resource can be allocated, the resource manager gives authorization to the application program to use the resource. The resource manager also controls resource allocation by restricting a data transfer bandwidth used by an application program and requesting a resource release on expiration of the valid time period.

Brief Summary Text (3):
The present invention relates to a technique for managing hardware and software resources (simply referred to as the "resources") used by an application program that a computer executes, and also relates to a digital video reproducing/recording apparatus that reproduces and records digitized video data.

Brief Summary Text (5):
There are various application programs that are executed by a computer. During the execution of an application program, data is inputted, outputted, and transferred using resources, such as a hard disk drive, bus, and memory.

Brief Summary Text (6):
Each resource has a use tolerance limit. For example, a hard disk drive and a PCI (Peripheral Component Interconnect) bus have respective limits to a speed at which data is transferred through them. To be more specific, each of them has a limit to a data transfer bandwidth. When an application program performs synchronous processes in which data needs to be transferred at certain timings, a predetermined data transfer bandwidth should be secured for the associated resources so that the application program can normally work.

Brief Summary Text (7):
For a system under which application programs simultaneously run, if an application program ignores the other application programs and uses resources without limitation, an application program performing synchronous processes may fail to work normally.

Brief Summary Text (8):
There have been techniques suggested in order to prevent such a fail from occurring during the execution of the program. As one example of such techniques, for a system under which application programs run according to the control of a multitask OS (Operating System), each application program is programmed beforehand so that two tasks that execute synchronous processes using the same resources will not be executed in parallel and that each application program can be exclusively executed.

Brief Summary Text (9):
An explanation is given below for a case of a conventional non-linear editing system that is composed of a CPU, a memory, a hard disk drive, a bus, a monitor, and a VTR, and performs video editing. According to, for example, a control program for receiving instructions from a user, this conventional non-linear editing system is controlled so as not to allow the user to

simultaneously execute a recording process and an editing process. In the recording process, video inputted by means of a VTR or the like serving as an inputting device is recorded onto a hard disk at a constant transfer speed. In the editing process, meanwhile, the video that has been recorded onto the hard disk is edited while being reproduced at a constant speed. The conventional non-linear editing system is controlled with the aim of guaranteeing a data transfer bandwidth for each of the recording and editing processes. However, there may be a case where the data transfer bandwidth is adequately broad as the limit for a resource. In this case, the system cannot make effective use of the resource.

Brief Summary Text (10):
In order to effectively use the resources on the system that executes a plurality of application programs, each application program needs to be specially programmed beforehand so as to work in cooperation with the other application programs in terms of the uses of the resources. The application programs also need to be programmed in consideration of a case where a task performing synchronous processes and a task performing asynchronous processes are simultaneously executed. To be more specific, the application program associated with the asynchronous processes needs to be programmed so that the data transfer band to be used is reduced in width. With the reduced transfer bandwidth, this application program will not interfere with the execution of the synchronous processes.

Brief Summary Text (11):
It is difficult, however, to specially program the application programs so that they will work in cooperation with each other. This is because the special programming depends on the respective limits of the resources, and in addition to this, there may be a case where the combination of the application programs to be simultaneously executed is unknown. Also, the special programming is not desirable in view of effects caused by variations in the resource environment and the program organization for the system. Such variations are ascribable to changes and additions of resources and additions of application programs.

Brief Summary Text (21):
It is therefore a first object of the present invention to provide a resource management system that dynamically allocates various types of resources to various processes executed under the control of a multitask OS so that each resource is effectively used and that each application program is smoothly executed without having to include a process that is dependent on the respective usage limits of the resources and respective levels at which the other application programs need the resources.

Brief Summary Text (22):
It is a second object of the present invention to provide an efficient digital video reproducing/recording apparatus, as one example application for the resource management system of the present invention, that allows a video recording process to be executed in response to a request even when a video reproducing process is being currently executed.

Brief Summary Text (23):
The first object of the present invention can be achieved by a resource management system for managing use of at least one resource by a plurality of application programs by authorizing application programs to use at least part of a capacity of a resource over an authorization period, the resource management system made up of: a resource management information database for storing limit information and authorization information for each resource, the limit information for a resource showing a capacity of the resource and the authorization information for a resource showing how much capacity is currently allocated to application programs; a request receiving unit for receiving a resource use request from an application program together with period information that indicates a time period for which the application program wishes to use the resource; and a resource use managing unit for making a judgement, when the request receiving unit has received the resource use request, as to whether the requested resource is available to the application program by referring to the limit information and the authorization information, wherein when the requested resource is available, the resource use managing unit determines the authorization period based on the period information, gives authorization to the application program to use the resource for the authorization period, and updates the authorization information in accordance with the capacity allocated to the application program.

Brief Summary Text (24):

With the stated construction, the resource use managing unit centralizes the management of the usage limit and the allocated volume for each resource using the resource management information database. With the centralized management by the resource use managing unit, each application program can obtain authorization to use a resource when it is available, only by sending a resource use request to the resource use managing unit. Therefore, the application program does not have to include a process that is dependent on the respective usage limits of the resources and respective levels at which the other application programs need the resources. After obtaining authorization to use the resource, the application program appropriately executes a process, such as data transfer, using the resource. In a case where the usage limit is changed due to resource additions to the resource management system, the contents of the resource management information database may be updated in accordance with the resource additions. By this updating, all the resources can be effectively used. In particular, the authorization period (referred to as the "valid time period" in the specification) for which the resource is authorized to be allocated is determined in accordance with the time period requested by the application program. Thus, the resource is released on the expiration of the valid time period and becomes available to another application program. Accordingly, the application program sends the resource use request together with information indicating a time period required for the process, thereby preventing the resource from being unavailable to another application program for an unnecessarily long period of time.

Brief Summary Text (25):
Using the stated resource management system, the resource use managing unit may include a timer for measuring a time that has elapsed since the application program was given authorization to use the resource, and request the application program to release the resource when reference to the timer indicates that the authorization period has expired.

Brief Summary Text (26):
Also, when receiving the request from the resource use managing unit to release the resource, the application program may stop using the resource and notify the resource use managing unit that the resource has been released, and in response to the notification from the application program that the resource has been released, the resource use managing unit may update the authorization information stored in the resource management information database.

Brief Summary Text (27):
This construction can avoid a case where an application program cannot use a resource since another application program uses the resource for unnecessarily long period of time for some reason.

Brief Summary Text (28):
Using the resource management system, the resource use managing unit may receive minimum capacity information from the application program when the request receiving unit receives the resource use request, and store the minimum capacity information in the resource management information database, the minimum capacity information showing a minimum resource capacity required by the application program. When the request receiving unit has received the resource use request and the resource use managing unit judges that a first capacity that is equal to or greater than the capacity shown by the minimum capacity information is available, the resource use managing unit may give authorization to the application program to use the resource and update the authorization information to show that the application program has obtained authorization to use a part of the resource capacity amounting to the first capacity.

Brief Summary Text (29):
With the stated construction, if judging that the volume equal to or greater than the minimum volume requested by the application program can be allocated, the resource use managing unit gives authorization to the application program to use the resource by that volume. Accordingly, using the resource management system of the present invention, a control operation is realized so that, for example, an application program that reproduces video data in real time can reliably acquire necessary resources with authorization.

Brief Summary Text (30):
The resource use managing unit may receive priority information from the application program when the request receiving unit receives the resource use request, the priority information showing a level at which the resource is required by the application program, and may store the priority information in the resource management information database. The resource use managing

unit may make the judgement as to whether the requested resource is available to the application program by comparing the priority information for the application program with priority information already stored in the resource management information database for another application program that has already requested the resource.

Brief Summary Text (31):
With this construction, when an application program requests for a resource while another application program is using the resource, the resource is appropriately allocated in accordance with priority that is set for each application program. The priority is set according to the level at which the application program needs the resource to execute its own process.

Brief Summary Text (32):
The priority information may include acquisition priority information and use continuation information, the acquisition priority information showing a level at which the application program needs to acquire the resource and the use continuation information showing a level at which the application program needs to continue to use the resource after obtaining authorization to use the resource. The resource use managing unit may make the judgement as to whether the requested resource is available to the application program by comparing the acquisition priority information for the application program with use continuation priority information already stored in the resource management information database for another application program that has already requested the resource and is currently using the resource.

Brief Summary Text (33):
The application program can set the acquisition priority and the use continuation priority separately according to its own process. As such, a full execution is ensured for the application program that performs a process, such as data transfer, that cannot be interrupted after the application program has acquired the resource for the process. Accordingly, using the resource management system of the present invention, the resource allocation can be controlled in accordance with the processes executed by the application programs.

Brief Summary Text (34):
Using the stated resource management system, the resource may be used as a data transfer path and the resource use managing unit may give authorization to the application program by transferring an ID that specifies current capacity information included in the authorization information, the current capacity information showing a part of the resource capacity which the application program has been given authorization to use by the resource use request. The application program may be a client program that notifies a server program of the ID transferred by the resource use managing unit so that a data transfer is executed via the server program using the resource. The server program may specify the current capacity information using the ID notified by the application program and executes the data transfer in accordance with the current capacity information.

Brief Summary Text (35):
The application program is authorized to use the resource by the specified volume. Thus, a server program may be set so as to execute data transfer directly using the resource in accordance with a volume authorized by the resource manager. The application program requests for the resource by a volume necessary for the process, and is then given authorization by the resource manager to use the resource by the necessary volume. Although the respective conditions, such as data transfer bandwidth, are different, a plurality of application programs can respectively execute processes in parallel using the same resource. To be more specific, an application program for executing asynchronous processes and an application program for executing synchronous processes can share the resource in accordance with the respective necessary conditions.

Brief Summary Text (36):
The resource may be a local bus used for transferring data, and the capacity of the resource and the amount of the capacity having been allocated to application programs each may be expressed as a data transfer bandwidth. The server program may execute the data transfer using the data transfer bandwidth shown by the current capacity information.

Brief Summary Text (37):

With the stated construction, each of a plurality of application programs that execute data transfer using a local bus, such as a PCI bus, can given a data transfer bandwidth within the limit of the data transfer bandwidth of the local bus. Therefore, the application program reliably acquires a necessary data transfer bandwidth.

Brief Summary Text (38):
The plurality of application programs may include first and second application programs. When the resource use managing unit has already given authorization to the first application to use a resource in response to a first resource use request and receives a second resource use request from the second application program to use the resource, the resource use managing unit may compare the priority information for the second application program with the priority information for the first application program. If the second application program has priority over the first application program, the resource use managing unit may reduce the capacity shown by the current capacity information for the first application program and extend the authorization period for the first application program so that the second application program is also authorized to use the resource.

Brief Summary Text (39):
As a result of the adjustment based on the priority assigned to each application program, the volume allocated to the application program that needs the resource less than the other application program is reduced and its valid time period is extended. This enables the application program that needs the resource less to complete the data transfer eventually.

Brief Summary Text (40):
When the resource use managing unit has reduced the capacity shown by the current capacity information related to the first application program and has given authorization to the second application program to use the resource in response to the second resource use request, the resource use managing unit may increase the capacity allocated to the first application program on completion of the second application program executed using the resource.

Brief Summary Text (41):
After the volume allocated to the application program that needs the resource less than the other application program is reduced as a result of the adjustment based on the priority assigned to each application program, the reduced volume is increased when the resource becomes available. This is to say, the resource allocation is dynamically controlled in accordance with the currently-allocated volume of the resource so that the resource can be effectively used.

Brief Summary Text (42):
When the request receiving unit receives the resource use request from the application program and the resource use managing unit judges that the requested resource is unavailable to the application program, the resource use managing unit may give authorization to the application program to use the resource when the resource becomes available.

Brief Summary Text (43):
With this construction, when the resource is currently unavailable, the application program can wait for the resource to be released and then uses the resource when it becomes available. This unit that the application program can reserve the resource when it is currently unavailable.

Brief Summary Text (44):
When the request receiving unit receives the resource use request from the application program and the resource use managing unit judges that the requested resource is unavailable to the application program since another application program has obtained authorization to use the resource, the resource use managing unit may notify the application program of information regarding a time to be taken before an expiration of the authorization period given to the other application program.

Brief Summary Text (45):
With the stated construction, the application program can comprehend when the resource will become available. Then, a time at which the resource will become available may be displayed on a screen for the user.

Brief Summary Text (46):
When the request receiving unit receives a resource use request from an application program to

use a plurality of resources, the resource use managing unit may judge whether the requested resources are available to the application program. When the requested resources are available to the application program, the resource use managing unit may give authorization to the application program to use the resources and so updates the authorization information stored in the resource management information database.

Brief Summary Text (47):
With this centralized management of the resources, deadlock, where the application program has to wait for another application to finish using the resources, can be prevented.

Brief Summary Text (48):
When receiving a notification from the application program that a part of at least one of the resources has been released, the resource use managing unit may update the capacity shown by the authorization information in accordance with the released capacity.

Brief Summary Text (49):
With this construction, the application program can release a part of the resources that have been acquired at one time, so that another application program can use the released part.

Brief Summary Text (50):
A resource management system may manages use of at least one resource by a plurality of application programs by authorizing application programs to use at least part of a capacity of a resource over an authorization period, the resource management system made up of: a request receiving unit for receiving a reservation request from an application program together with period information specifying use start and stop times; a resource management information database for storing limit information, authorization information, and the period information, the limit information for a resource showing a capacity of the resource, and the authorization information for a resource showing how much capacity is currently allocated to application programs; a resource use managing unit for making a judgement, when the request receiving unit has received the reservation request, as to whether the requested resource will be available to the application program for the time period specified by the start and stop times by referring to the limit information, the authorization information, and the period information, wherein when the requested resource will be available for the specified time period, the resource use managing unit determines the authorization period based on the period information, gives authorization to the application program, upon the use start time, to use the requested resource for the authorization period, and updates the authorization information and the period information.

Brief Summary Text (51):
With the stated construction, each application program can reliably secure necessary resources for future use. This is to say, the application program is given a guarantee that the resources will be allocated to the application program.

Brief Summary Text (54):
In the digital video reproducing process, the encoded video data stored in the storing unit may be decoded either by the first and second CODECs or only by the second CODEC, the decoded video data may be mixed by a mixing circuit, and the mixed data may be converted into analog video by a D/A converter. In the digital video recording process, analog video may be converted into digital video data by an A/D converter, the digital video data may be encoded by the first CODEC, and the encoded digital video may be stored in the storing unit. The retaining unit may retain information showing a current use state for each CODEC, each current use state showing whether the corresponding CODEC is being used. The judging unit may include: a selecting unit for selecting at least one CODEC from the first and second CODECs in accordance with the process requested by the user; and an allocation judging unit for judging whether each CODEC selected by the selecting unit is available to the requested process, by referring to the information retained in the retaining unit.

Brief Summary Text (56):
Using the stated digital video reproducing/recording apparatus, the retaining unit may retain a process name of either the digital video reproducing process or the digital video recording process, for each CODEC that is currently being used. The request receiving unit may further receive maximum and minimum numbers of CODECs to be used in the requested process, the maximum number indicating a preferred number of CODECs required for the requested process and the

minimum number indicating a lowest number of CODECs required for the requested process. The allocation judging unit may include: a first notifying unit for notifying, when a number of CODECs equal to the maximum are indicates as being "unallocated" by the retaining unit, the execution controlling unit that the maximum number of CODECs are available for allocation to the requested process; and a second notifying unit for notifying, when the number of CODECs indicated as being "unallocated" is below the maximum number but at least equal to the minimum number, the execution controlling unit that the minimum number of CODECs are available for allocation to the requested process.

Brief Summary Text (58):
The allocation judging unit may include: a release requesting unit for requesting the execution controlling unit, when a number of CODECs equal to the minimum are indicated as being "allocated" and this minimum number of CODECs are judged to be available to the requested process if a number of CODECs used in a currently-executed process is changed to the minimum number for the currently-executed process, to release the minimum number of CODECs for the requested process; and a third notifying unit for notifying, when the execution controlling unit has released the minimum number of CODECs for the requested process, the execution controlling unit that the minimum number of CODECs for the requested process is available for allocation to the requested process.

Brief Summary Text (59):
With this construction, when not every CODEC cannot be allocated to the requested process and the number of CODECs used in the currently-executed process can be changed, at least one of the CODECs currently having been used may be released so as to be allocated to the requested process. For example, when the recording process is requested during the execution of the two-channel reproduction process, the two-channel reproduction process is changed to the one-channel reproduction process so that the recording process can be executed.

Brief Summary Text (60):
The retaining unit may include: an unallocated hardware resource retaining unit for retaining information about each CODEC that is currently unallocated; an allocated hardware resource retaining unit for retaining information about each CODEC that is currently allocated; a first moving unit for moving the information about each CODEC that is judged by the allocation judging unit to be allocated to the requested process, from the unallocated hardware resource retaining unit into the allocated hardware resource retaining unit; and a second moving unit for moving, when receiving a notification that at least one of the first and second CODECs has been released, the CODEC from the allocated hardware resource retaining unit into the unallocated hardware resource retaining unit. The allocation judging unit may authorize allocation of each CODEC selected by the selecting unit when the information about the CODEC is retained in the unallocated hardware resource retaining unit.

Brief Summary Text (61):
With the stated construction, each CODEC can be easily judged to be allocated or unallocated. When the first CODEC is currently unallocated, the recording process can be executed using the first CODEC even when the recording process is currently being executed. Thus, the recording process can be effectively executed in parallel with the reproducing process.

Brief Summary Text (62):
The request receiving unit may further receive maximum and minimum numbers of CODECs to be used in the requested process, the maximum number indicating a preferred number of CODECs required for the requested process and the minimum number indicating a lowest number of CODECs required for the requested process. The allocation judging unit may include: a first notifying unit for notifying, when a number of CODECs equal to the maximum are retained in the unallocated hardware resource retaining unit, the execution controlling unit that the maximum number of CODECs are available for allocation to the requested process; and a second notifying unit for notifying, when the number of CODECs retained in the unallocated hardware resource retaining unit is below the maximum number but a number of CODECs retained in the unallocated hardware resource retaining unit is at least equal to the minimum number, the execution controlling unit that the minimum number of CODECs for the requested process are available for allocation.

Brief Summary Text (64):
The first moving unit may write a name of the requested process into the allocated hardware resource retaining unit when moving each CODEC allocated to the requested process from the

unallocated hardware resource retaining unit into the allocated hardware resource retaining unit. The allocation judging unit may include: a release requesting unit for requesting the execution controlling unit, when a number of CODECs equal to the minimum required for the requested process is retained in the allocated hardware resource retaining unit and this minimum number of CODECs are judged to be available for allocation to the requested process if a number of CODECs used in a currently-executed process is changed to the minimum number for the currently-executed process, to release the minimum number for the requested process; and a third notifying unit for notifying, when the execution controlling unit has released the minimum number of CODECs for the requested process and the second moving unit moves each released CODEC from the allocated hardware resource retaining unit into the unallocated hardware resource retaining unit, the execution controlling unit that the minimum number of CODECs for the requested process are available for allocation to the requested process.

Brief Summary Text (65):
With this construction, when not every CODEC cannot be allocated to the requested process and the number of CODECs used in the currently-executed process can be changed, at least one of the CODECs currently having been used may be released so to as to be allocated to the requested process. Accordingly, the first and second CODECs can be more effectively used.

Brief Summary Text (66):
The retaining unit may include: an unallocated hardware resource retaining unit for retaining information for each CODEC that is currently unallocated; a deleting unit for deleting the information about each CODEC that is judged by the allocation judging unit to be available to the requested process, from the unallocated hardware resource retaining unit; a writing unit for writing, when receiving a notification that each allocated CODEC has been released, the CODEC into the unallocated hardware resource retaining unit. The allocation judging unit may authorize allocation of each CODEC to the requested process when the CODEC is retained in the unallocated hardware resource retaining unit.

Drawing Description Text (8):
FIG. 6 shows the contents of resource request information 2500;

Drawing Description Text (9):
FIG. 7 shows the contents of a resource management DB 2020;

Drawing Description Text (10):
FIG. 8 is a flowchart showing a resource use request receiving process performed by the resource manager 2010 when receiving a request from a client to use a resource;

Drawing Description Text (11):
FIG. 9 shows an example of a message sequence followed when the client use the resource;

Drawing Description Text (12):
FIG. 10 shows an example of a message sequence followed when the valid period of the key information is expired while the client is using the resource;

Drawing Description Text (13):
FIG. 11 shows an example of a message sequence followed when the client 2100a issues a request to use a resource while the client 2100b is currently using the resource;

Drawing Description Text (15):
FIG. 13 shows an example of a GUI screen that notifies the user of the changes having been made to the data transfer bandwidth and the valid period regarding the use of resource;

Drawing Description Text (16):
FIG. 14 shows an example of a message sequence followed when the client 2100b issues a request to use a resource while the client 2100c is currently using the resource;

Drawing Description Text (17):
FIG. 15 shows an example of a GUI screen displayed so as to provide the user with the information regarding the time to be taken before the resource is released;

Drawing Description Text (18):

FIG. 16 shows an example of a message sequence followed when the client 2100a issues a request to use a resource while the client 2100b is currently using the resource, in the first modification;

Drawing Description Text (20):
FIG. 18 shows an example of a representation of the resource management timetable included in the resource management DB 2020 in the second modification;

Drawing Description Text (21):
FIG. 19 shows an example of a system that centralizes the management of resources distributed on a network using one resource manager;

Drawing Description Text (23):
FIG. 21 shows an initial state of a hardware resource management table 201 stored in a hardware resource storing unit 121;

Drawing Description Text (24):
FIG. 22A shows a list example of a necessary hardware resource 133 of a reproducing process 131;

Drawing Description Text (26):
FIG. 23A shows a list example of a necessary hardware resource 135 of a recording process 132;

Drawing Description Text (28):
FIG. 24 shows a content example of a hardware resource management table;

Drawing Description Text (29):
FIG. 25 shows a content example of a hardware resource management table;

Drawing Description Text (30):
FIG. 26 shows a content example of a hardware resource management table;

Drawing Description Text (31):
FIG. 27 shows signal flows of the video data among the hardware resources provided for a video reproduction/recording executing unit;

Drawing Description Text (32):
FIG. 28 is a flowchart of an operation performed by a hardware resource managing unit;

Drawing Description Text (34):
FIG. 30 is a flowchart of an operation performed by the hardware controlling unit when receiving an interruption request from a hardware resource managing unit;

Drawing Description Text (35):
FIG. 31 shows a construction of a hardware resource managing unit of a digital video reproducing/recording apparatus of a third embodiment of the present invention;

Drawing Description Text (36):
FIG. 32 shows contents stored in an all-resource storing unit;

Drawing Description Text (37):
FIG. 33A shows an example of contents stored in an allocated hardware resource storing unit;

Drawing Description Text (38):
FIG. 33B shows an example of contents stored in an unallocated hardware resource storing unit;

Drawing Description Text (39):
FIG. 34A shows an example of contents stored in the allocated hardware resource storing unit;

Drawing Description Text (40):
FIG. 34B shows an example of contents stored in the unallocated hardware resource storing unit;

Drawing Description Text (41):
FIG. 35 shows a construction of a hardware resource managing unit of a digital video reproducing/recording apparatus of a fourth embodiment of the present invention;

Drawing Description Text (42):
FIG. 36 is a flowchart of an operation performed by a hardware resource managing unit;

Drawing Description Text (43):
FIG. 37 shows hardware resources provided for the digital video reproducing/recording apparatus of a fifth embodiment and also shows data flow when the hardware resources perform a function of digitizing and recording inputted video;

Drawing Description Text (46):
FIG. 40 shows an example of a data construction and contents of the resource request information 6500 that is referred to when a plurality of resources are requested at one time;

Drawing Description Text (47):
FIG. 41 shows contents stored in the resource management DB immediately after the request for the plurality of resources has been accepted;

Drawing Description Text (48):
FIG. 42 shows an example of a data construction and contents of the some-resources release information 6700 that is referred to when some of the resources having been acquired at one time are to be released;

Drawing Description Text (49):
FIG. 43 shows contents stored in the resource management DB in a case where the editor has been activated after the digitizer AP had suspended the preview process; and

Drawing Description Text (50):
FIG. 44 shows an example of a data construction and contents of the resource repeat request information 6800 that is referred to when some resources are needed in addition to the resources having been acquired at one time.

Detailed Description Text (3):
The following is a description of a resource management system of a first embodiment of the present invention, with reference to FIG. 4 to FIG. 15.

Detailed Description Text (8):
The CPU 1010, the memory 1020, the user input receiving device 1030, the effect board 1050, the SCSI board 1060, and the network card 1070 are provided in a personal computer (referred to as the "PC" hereinafter). These components are connected to one another via the PCI bus 1040. The PCI bus 1040, the hard disk drive 1061, and the memory 1020 used as resources for transferring data have respective limits to their data transfer bandwidths. The PCI bus 1040 is a synchronous bus whose maximum clock frequency is 33 MHz and whose maximum data transfer speed, that is, the usage limit, is 133 megabytes per second (hereinafter "MB/s").

Detailed Description Text (11):
FIG. 5 shows a software construction of the non-linear editing system 1000. As shown in FIG. 5, the non-linear editing system 1000 is composed, in terms of software, of a resource manager 2010, a resource management database (DB) 2020, clients 2100a to 2100m, and servers 2200a to 2200n. FIG. 5 also shows resources 2300a to 2300n that are respectively used by the servers 2200a to 2200n. The resources 2300a to 2300n correspond to the PCI bus 1040, the hard disk drive 1061, etc.

Detailed Description Text (12):
The resource management DB 2020 includes a data set used for managing the resources, the data set being stored in a file of the hard disk or an area of the memory 1020.

Detailed Description Text (13):
The resource manager 2010 performs various kinds of control operations associated with the resource management. For doing so, the resource manager 2010 comprehends the capacity for each resource type and the state of each resource as to whether it is used or not, by referring to

and updating the resource management DB 2020. As one example of the control operations, the resource manager 2010 receives a resource use request from a client and generates key information in the resource management DB 2020, and then informs the client of a key ID as an ID of the key information. As another example, the resource manager 2010 sends an instruction to the client to release the resource when the valid period (or, the authorization period) of the key information has been expired. The contents of the resource management DB 2020, such as the key information, will be explained later in this specification.

Detailed Description Text (14):
Each client 2100a to 2100m sends a resource use request to the resource manager 2010 and then receives a key ID from the resource manager 2010. The client 2100a to 2100m then informs the corresponding server of the key ID so as to be allowed to use the resource. To be more specific, the client 2100a to 2100m transfers, input, and outputs data using the resource via the server. The clients 2100a to 2100m are application programs executed for the non-linear editing. For example, the clients 2100a to 2100m correspond to a digitizer for fetch-editing the video data or the like, a clip editor for editing the video data or the like in units of data sections, and a sequence editor for editing in regard to a time series arrangement of the video data or the like. It should be noted here that each client 2100a to 2100m cannot use the resource unless receiving the key ID from the resource manager 2010. This is to say, the resource manager 2010 gives a key ID to the client as authorization to use of the resource.

Detailed Description Text (15):
The servers 2200a to 2200n are service programs corresponding to, for example, device drivers. Each server 2200a to 2200n refers to the key information specified by the key ID that has been received from the client and uses the corresponding resource 2300a to 2300n in accordance with the key information. The server 2200a to 2200n accordingly controls executions of data transfer, data input, and data output using the resource 2300a to 2300n.

Detailed Description Text (16):
The functions of the resource manager 2010, the servers 2200a to 2200n, and the clients 2100a to 2100m are implemented by the CPU 1010 that executes the associated programs stored in the memory 1020. The resource manager 2010 and the clients 2100a to 2100m are application programs that run under the control of the multitask OS. The resource manager 2010 is activated on the activation of the multitask OS.

Detailed Description Text (17):
The following is an explanation of resource use request detailed information (simply referred to as the "resource request information" hereinafter) that is issued together with the resource used request by a client to the resource manager 2010.

Detailed Description Text (18):
FIG. 6 shows the contents of resource request information 2500. As shown in this figure, the resource request information 2500 includes a client ID 2501, an object resource ID 2502, a valid period 2503, a maximum volume 2504, a minimum volume 2505, an acquisition priority 2506, and a use continuation priority 2507. In the right-hand columns, a value example is shown for each piece of information. It should be noted here that "volume" referred to in the present specification means the "capacity."

Detailed Description Text (19):
The client ID 2501 is an ID specifying a client that issued the resource use request. The object resource ID 2502 is an ID specifying a resource that the client has requested for. The valid period 2503 refers to a time period that the client has requested to use the resource. The maximum volume 2504 and the minimum volume 2505 respectively indicate the maximum and minimum volumes by which the client has requested for the resource. More specifically, the maximum volume 2504 indicates a desirable volume for executing a process using the resource while the minimum volume 2505 indicates the volume that is required at the minimum.

Detailed Description Text (20):
The acquisition priority 2506 indicates the priority of the client as to acquisition of the resource, and is represented by one of Levels 1 to 4 in accordance with the level at which the client needs the resource. More specifically, Level 4 is the highest level indicating a case where the client needs the resource most, such as when the client is in urgent need of the resource and so definitely uses the resource. Level 3 indicates a case where the current client

is given priority to use the resource over another client if the volume used by the other client can be reduced or the other client can suspend the current use of the resource and, if not, the current client will use the resource after the other client has finished using the resource. Level 2 indicates that if another client is currently using the resource, the client uses the resource after the other client has finished using the resource. Level 1 indicates that the client does not use the resource if the resource is not available since another client is currently using the resource.

Detailed Description Text (21):
The use continuation priority 2507 indicates the priority of the client as to the continuation of using the resource. The use continuation priority 2507 is referred to when another client has requested for the same resource as is being used by the current client. As in the case of the acquisition priority 2506, the use continuation priority 2507 is represented by one of Levels 1 to 4 in accordance with the level at which the current client needs to continue to use the resource. Level 4 is the highest level indicating a case where the client needs to continue to use the resource most. Level 3 indicates a case where the current volume being used may be reduced within the volume shown as the minimum volume 2505. Level 2 indicates that the use of the resource by the current client may be suspended when another client has requested for the resource. Level 1 indicates that the client may release the resource if another client has requested for the resource.

Detailed Description Text (22):
The contents of the resource management DB 2020 are explained. FIG. 7 shows the contents of the resource management DB 2020. The resource management DB 2020 has resource management information for each resource. FIG. 7 shows an example of the information related to the resource whose resource ID is 0x01. Suppose here that the present resource is the PCI bus 1040. The resource management DB 2020 has resource management information 3100 associated with the PCI bus 1040 and three sets of key information 3200, 3300, and 3400 associated in turn with the resource management information 3100. In the right-hand columns, value examples are shown for each piece of information.

Detailed Description Text (23):
As shown in FIG. 7, the resource management information 3100 includes a resource ID 3101, a total capacity of resource 3102, a number of keys 3103, and key IDs 3104, 3105, and 3106.

Detailed Description Text (24):
The total capacity of resource 3102 indicates the usage limit of the resource. To take the PCI bus 1040 as an example in this case, the total volume (or, the limit for the data transfer bandwidth) that enables each client to execute a process is set at 100 MB/s. Note that the data transfer bandwidth is expressed as the data transfer speed. The total capacity of resource 3102 is set below the actual usage limit inherent in the resource, such as the PCI bus 1040. The number of keys 3103 indicates the number of sets of key information respectively corresponding to the clients. In other words, the number of keys 3103 indicates the number of clients that are currently using the resource. The key IDs 3104, 3105, and 3106 each indicate an ID to specify the key information. The number of such key IDs is equivalent to the number indicated by the number of keys 3103.

Detailed Description Text (25):
The key information 3200 is used for managing the state of a specific resource used by a client. As shown in FIG. 7, the key information 3200 includes a key ID 3201, a client ID 3202, a valid period 3203, a current volume 3204, a maximum volume 3205, a minimum volume 3206, an acquisition priority 3207, and a use continuation priority 3208. The key information 3200 is generated when one of the clients has issued a request to use the resource to the resource manager 2010. Values representing the valid period 3203, the maximum volume 3205, the minimum volume 3206, the acquisition priority 3207, and the use continuation priority 3208 are respectively set based on the corresponding sets of information found in the resource request information 2500. To be more specific, the values are set respectively in accordance with the values of the valid period 2503, the maximum volume 2504, the minimum volume 2505, the acquisition priority 2506, and the use continuation priority 2507.

Detailed Description Text (26):
The key ID 3201 is an ID specifying the key information 3200. The key information 3200 and the resource management information 3100 correspond with each other by the key ID 3201 and the key

ID in the resource management information 3100. The client ID 3202 is an ID specifying the application program that has issued the request resulting in the generation of the key information.

Detailed Description Text (27):
The valid period 3203 refers to a valid time period of the key information itself, and is used for restricting the time period for which the resource will have been available to the client via the server. This is to say, the valid period 3203 indicates a valid time period for which the resource manager 2010 gives the client authorization to use the resource. It should be noted here that the resource manager 2010 updates the valid period 3203 with the passage of time or updates it as required.

Detailed Description Text (28):
The current volume 3204 is the volume that has been determined by the resource manager 2010 for the client to use. The current volume 3204 is referred to by a server when the data transfer or the like is to be performed by the server using the resource. By referring to the current volume 3204, the server can see the available volume of the resource, such as the data transfer bandwidth. Therefore, the current volume 3204 indicates the volume by which the client has been given authorization to use the resource, that is, the resource volume that can be used by the client via the server.

Detailed Description Text (29):
The maximum volume 3205 and the minimum volume 3206 respectively indicate the maximum and minimum volumes by which the client has requested for the resource. More specifically, the maximum volume 3205 indicates a desirable volume for executing a process using the resource while the minimum volume 3206 indicates the volume that is required at the minimum.

Detailed Description Text (30):
The acquisition priority 3207 indicates the priority of the client as to the acquisition of the resource, and is represented by one of Levels 1 to 4 in accordance with the level at which the client needs the resource. Note that even when the acquisition priority 3207 of the current client indicates Level 4, the resource cannot be used by the current client when another client is using the resource and the use continuation priority 3208 of the key information 3200 related to the other client indicates Level 4.

Detailed Description Text (31):
The use continuation priority 3208 indicates the priority of the client as to the continuation of using the resource. The use continuation priority 3208 is referred to when another client has requested for the same resource as is being used by the current client. As in the case of the acquisition priority 3207, the use continuation priority 3208 is represented by one of Levels 1 to 4 in accordance with the level at which the client needs to continue to use the resource.

Detailed Description Text (33):
The following is a description of operations performed by the non-linear editing system 1000 having the stated construction for the use of the resources.

Detailed Description Text (34):
First, a basic operation that is performed when a client uses a resource is explained with reference to FIG. 8 and FIG. 9. FIG. 8 is a flowchart showing a resource use request receiving process performed by the resource manager 2010 when receiving a resource use request from a client. FIG. 9 shows an example of a message sequence followed when the client use the resource.

Detailed Description Text (35):
As shown in FIG. 9, the client 2100a sends a resource use request 4001 to the resource manager 2010 so as to use a resource that is required for the execution of its own process.

Detailed Description Text (36):
Messages are sent/received using addresses, handles, or the like that are previously obtained from each other. For example, a client previously obtains an address of the resource manager 2010 as the destination of a message while the resource use request 4001 includes an address of the client as the destination of a response message from the resource manager 2010.

Detailed Description Text (37):
Suppose that the client 2100a is an application program used as a clip editor. This clip editor executes the data transfer at a high speed to some extent using the PCI bus 1040 via a server so as to enable the video data editing while keeping the video reproduction in real time. Also suppose that the resource use request 4001 includes the resource request information 2500 having the values shown in FIG. 6.

Detailed Description Text (38):
Upon receipt of the resource use request 4001 from the client 2100a, the resource manager 2010 performs the resource use request receiving process shown in FIG. 8 by referring to the resource request information 2500 and the resource management DB 2020.

Detailed Description Text (39):
As shown in the flowchart of FIG. 8, the resource manager 2010 first judges whether the resource requested by the client 2100a is available (step S3501). This judgement is made as follows. The resource manager 2010 refers to the resource management information 3100 associated with the resource whose ID is 0x01 indicated by the object resource ID 2502. The resource manager 2010 calculates the volume that is currently available by subtracting the total of the current volume 3204 included in all of the sets of the key information linked with the resource management information 3100 from the total capacity of resource 3102. Then, the resource manager 2010 judges whether the calculated volume is equal to or more than the minimum volume requested by the client 2100a.

Detailed Description Text (40):
When judging that the resource can be used by the client 2100a ("yes" in step S3501), the resource manager 2010 generates the key information based on the resource request information 2500 and links the generated key information with the resource management information 3100 by adding a key ID of the key information to the resource management information 3100 (step S3504). Following this, the resource manager 2010 sends a key ID notification 4002 (see FIG. 9) including the key ID to the client 2100a (step S3505). The key information is generated based on the values indicated in the corresponding sets of information in the resource request information 2500. Also, the currently available volume calculated as described above is indicated as the current volume 3204 in the key information. Accordingly, the key information 3200 is generated.

Detailed Description Text (41):
When judging that the resource cannot be used by the client 2100a ("no" in step S3501), the resource manager 2010 next makes a judgement by referring to the acquisition priority 2506 in the resource request information 2500 that is included in the resource use request 4001 and to the use continuation priority 3208 in each set of key information that has been generated for the current resource (step S3502). Specifically, the resource manager 2010 judges whether the use of the resource by another client can be suspended or whether the volume used by the other client can be reduced. If possible ("yes" in step S3502), the resource manager 2010 adjusts the use of the resource by the other client (step S3503). After this, the resource manager 2010 generates key information (step S3504) and sends a key ID notification 4002 to the client 2100a (step S3505).

Detailed Description Text (42):
When judging once again that the resource cannot be used ("no" in step S3502), the resource manager 2010 next judges whether the acquisition priority 2506 of the resource request information 2500 of the client 2100a indicates Level 1 (step S3506). If so ("yes" in step S3506), the resource manager 2010 sends a message to the client 2100a that the resource cannot be used (step S3508). If not ("no" in step S3506), the resource manager 2010 waits for the resource management DB 2020 to be updated according to the changes in the resource volume (step S3507) and returns to step S3501. More specifically, when the client 2100a has requested with the acquisition priority of Level 2, the resource manager 2010 has the client 2100a wait until the resource becomes available. After confirming the availability of the resource, the resource manager 2010 sends the key ID notification 4002 to the client 2100a. In step S3507, the resource manager 2010 sends the client 2100a a message to wait for the resource to become available.

Detailed Description Text (43):

After receiving the key ID notification 4002 from the resource manager 2010 during the resource use request receiving process, the client 2100a sends a resource use instruction 4003 (see FIG. 9) including the key ID to the server 2200a. Although not shown in FIG. 5, the non-linear editing system 1000 may have a construction where each client has access to the resource management DB 2020. In this case, the client 2100a can refer to the key information 3200 in the resource management DB 2020 according to the key ID.

Detailed Description Text (44):
Upon receipt of the resource use instruction 4003 from the client 2100a, the server 2200a refers to the key information 3200 in the resource management DB 2020 according to the key ID. With reference to the key information 3200, the server 2200a adjusts, for example, the transfer timing so that the data transfer is executed by means of the data transfer bandwidth indicated by the current volume 3204. After the data transfer, the server 2200a sends a resource release notification 4004 (see FIG. 9) to the client 2100a. During the data transfer, the data is sent/received between the client 2100a and the server 2200a.

Detailed Description Text (45):
Upon receiving the resource release notification 4004 from the server 2200a, the client 2100a sends a resource release completion notification 4005 (see FIG. 9) including the key ID to the resource manager 2010.

Detailed Description Text (46):
In response to the resource release completion notification 4005 from the client 2100a, the resource manager 2010 updates the resource management DB 2020, meaning that the associated sets of key information are deleted from the resource management DB 2020. Accordingly, a series of operations performed when the client uses the resource is terminated.

Detailed Description Text (47):
Next, an explanation is given for a case where the valid period of the key information has been expired. FIG. 10 shows an example of a message sequence followed when the valid period of the key information is expired while the client is using the resource.

Detailed Description Text (48):
As shown in FIG. 10, this message sequence is the same as the one shown in FIG. 9 up to the point where the server 2200a executes the data transfer after receiving the resource use instruction 4003 from the client 2100a.

Detailed Description Text (49):
When the valid period indicated by the valid period 3203 in the key information 3200 included in the resource management DB 2020 has been expired during the data transfer executed by the server 2200a, the resource manager 2010 sends a period expiration notification 4011 to the client 2100a. It should be noted here that, in order to judge whether the valid period has been expired, the resource manager 2010 reduces the value indicated by the valid period 3203 after sending the key ID notification 4002 to the client 2100a. For doing so, the resource manager 2010 uses a timer or the like that is realized by software of the multitask OS.

Detailed Description Text (50):
Upon receipt of the period expiration notification 4011, the client 2100a sends a resource release instruction 4012 to the server 2200a.

Detailed Description Text (51):
In response to the resource release instruction 4012, the server 2200a suspends the data transfer and releases the resource. Then, the server 2200a sends a resource release notification 4004 to the client 2100a.

Detailed Description Text (52):
After this, as in the case shown in FIG. 9, the client 2100a sends the resource release completion notification 4005 to the resource manager 2010 which then updates the resource management DB 2020. Accordingly, a series of operations performed when the valid period of the key information has been expired while the resource is being used.

Detailed Description Text (53):
Next, an explanation is given for a case where another client (the client 2100a in the present

example) issues a request to use a resource while the client 2100b is currently using the resource, with reference to FIG. 11 and FIG. 8. FIG. 11 shows an example of a message sequence followed when the client 2100a issues a request to use a resource while the client 2100b is currently using the resource.

Detailed Description Text (54):
The client 2100b is an application program that, for example, transfers network data via the server 2200b and is currently using the resource. The total capacity of resource 3102 in the resource management information 3100 related to the resource indicates 100 MB/s. As the key information of the client 2100b, the current volume is 60 MB/s, the minimum volume is 30 MB/s, and the use continuation priority is Level 3. Here, note that the PCI bus 1040 is used as both the resources 2300a and 2300b that are respectively used by the servers 2200a and 2200b.

Detailed Description Text (55):
As shown in FIG. 11, the client 2100a sends the resource use request 4001 to the resource manager 2010. The resource request information 2500 included in the request 4001 has the values shown in FIG. 6.

Detailed Description Text (56):
Upon receipt of the resource use request 4001, the resource manager 2010 starts the resource use request receiving process explained above with reference to FIG. 8. To be more specific about the present case, the resource manager 2010 judges that the resource requested by the client 2100a cannot be used ("no" in step S3501), further judges that the resource can be used by adjusting the use of the resource by the other client ("yes" in step S3502), and accordingly adjusts the use of the resource by the other client (step S3503).

Detailed Description Text (57):
The acquisition priority in the resource request information sent from the client 2100a is Level 3, and the use continuation priority in the key information related to the client 2100b is Level 3. As such, the resource manager 2010 reduces the current volume in the key information related to the client 2100b from 60 MB/s to 30 MB/s, extends the valid period in the key information, and so updates the resource management DB 2020. Following this, the resource manager 2010 sends a request 4021 to the client 2100b, requesting to change the data transfer bandwidth. This message is referred to as the "bandwidth change request" 4021 hereinafter. The extension of the valid period in the key information is described later in this specification.

Detailed Description Text (59):
Upon receipt of the bandwidth change instruction 4022, the server 2200b refers to the current volume in the key information in the resource management DB 2020 that the server 2200b referred to on the start of the data transfer. In accordance with the current volume, the server 2200b reduces the data transfer bandwidth by changing, for example, the data transfer timing. After this, the server 2200b sends a bandwidth change notification 4023 to the client 2100b.

Detailed Description Text (60):
Upon receiving the notification 4023, the client 2100b sends a bandwidth change completion notification 4024 to the resource manager 2010.

Detailed Description Text (61):
In response to the notification 4024 from the client 2100b, the resource manager 2010 sets the current volume at 70 MB/s, and generates key information based on the resource request information having been received from the client 2100a. The resource manager 2010 then links the generated key information with the resource management information (step S3504 in FIG. 8), and sends the key ID notification 4002 including the key ID to the client 2100a (step S3505).

Detailed Description Text (62):
Upon receipt of the key ID notification 4002, the client 2100a sends the resource use instruction 4003 to the server 2200a, and performs the data transfer using the resource via the server 2200a thereafter.

Detailed Description Text (63):
As described up to this point, the source manager 2010 has the clients use a resource in order of priority, by adjusting the current volume if another client is currently using the resource.

In other words, the client that issues the highest-priority request can use the resource.

Detailed Description Text (64):
The following is an explanation for the extension of a valid period that is included in the key information related to the client 2100b, the extension being executed by the resource manager 2010. FIG. 12 shows a relation between the current volume and the valid period before and after the valid period of the key information related to the client 2100b is extended.

Detailed Description Text (65):
At first, the client 2100b was using the resource, with the valid period being t1 and the data transfer bandwidth being 60 MB/s. At the time t0, the resource manager 2010 reduces the data transfer bandwidth set for the client 2100b from 60 MB/s to 30 MB/s so as to have the client 2100a use the resource. The resource manager 2010 then divides the product of (t1-t0) and 60 MB/s by 30 MB/s, and sets the calculated quotient, i.e., (t2-t0), as a new remaining valid period for the client 2100b. The resource manager 2010 extends the valid period of the client 2100b, thereby enabling the data transfer that the client 2100b needs to perform.

Detailed Description Text (66):
When receiving the bandwidth change request 4021 from the resource manager 2010, the client 2100b can refer to the resource management DB 2020 in order to confirm the changes in the data transfer bandwidth and the valid period. Thus, a GUI (Graphical User Interface) screen as shown in FIG. 13 may be displayed on the monitor 1052. FIG. 13 shows an example of a GUI screen that notifies the user of the changes having been made to the data transfer bandwidth and the valid period.

Detailed Description Text (67):
Next, an explanation is given to a case where, in contrast to the stated case described with reference to FIG. 11, a client with a lower acquisition priority issues a request to use a resource to the resource manager 2010 while another client with a higher continuation priority is currently using the resource. The present case is explained with reference to FIG. 14 and FIG. 8. FIG. 14 shows an example of a message sequence followed when the client 2100b issues a request to use a resource while the client 2100c is currently using the resource.

Detailed Description Text (68):
Suppose here that the client 2100b needs to perform the network data transfer via the server 2200n without urgency, and its acquisition priority is Level 2. Meanwhile, the client 2100c needs to continue the data transfer at a high speed and has already been using the resource via the server 2200n. The use continuation priority of the client 2100c is Level 4.

Detailed Description Text (69):
As shown in FIG. 14, the client 2100b sends the resource use request 4001 to the resource manager 2010 while the client 2100c is currently using the resource.

Detailed Description Text (70):
In response to the request 4001, the resource manager 2010 starts the resource use request receiving process shown in FIG. 8. In the present case, the judgements are made to be "no" in steps S3501, S3502, and S3506. The resource manager 2010 sends a resource wait instruction 4031 to the client 2100b and waits for the resource to become available (step S3507).

Detailed Description Text (71):
On completion of the data transfer by the client 2100c via the server 2200n, the server 2200n sends the resource release notification 4004 to the client 2100c. In response to the notification 4004, the client 2100c sends the resource release completion notification 4005 to the resource manager 2010.

Detailed Description Text (72):
Upon receipt of the notification 4005, the resource manager 2010 updates the resource management DB 2020, meaning that the associated sets of key information are deleted from the resource management DB 2020. Following this, the resource manager 2010 proceeds to step S3501 where it judges that the resource can be used, and generates key information based on the resource use request issued by the client 2100b (step S3504). Then, the resource manager 2010 sends the key ID notification 4002 to the client 2100b (step S3505).

Detailed Description Text (73):
It should be noted here that, the resource wait instruction 4031 that is sent from the resource manager 2010 to the client 2100b in the present case includes the client ID and the valid period of the key information concerning the use of resource by the client 2100c. Therefore, by referring to the instruction 4031, the client 2100b that is to wait for the resource to be available can predict the time when the resource will become available. Also, a GUI screen as shown in FIG. 15 may be displayed on the monitor 1052, providing the user with information regarding the time to be taken before the resource is released. FIG. 15 shows an example of a GUI screen displayed so as to provide the user with the information regarding the time to be taken before the resource is released.

Detailed Description Text (74):
As described above, a client in the wait state can predict the time when the resource will become available. Thus, the client may stay on standby until the predicted time, without keeping checking whether the resource has been released. This results in the reduction of load on the CPU 1010.

Detailed Description Text (76):
The following is a description of a first modification of the non-linear editing system 1000, with reference to FIG. 16 and FIG. 17. In the first modification, the data transfer bandwidth that has been once reduced is increased, in addition to the series of operations that is performed following the message sequence shown in FIG. 11.

Detailed Description Text (77):
FIG. 16 shows an example of a message sequence followed when the client 2100a issues a request to use a resource while the client 2100b is currently using the resource, in the first modification.

Detailed Description Text (78):
As shown in FIG. 16, this message sequence is the same as the one shown in FIG. 11 up to the point where the client 2100a sends the resource use instruction 4003 to the server 2200a. More specifically, the resource manager 2010 sends the bandwidth change request 4021 to the client 2100b, and after reducing the data transfer bandwidth, sends the key ID notification 4002 to the client 2100a which then uses the resource because of its priority.

Detailed Description Text (79):
After the client 2100a has finished using the resource, the resource manager 2010 receives the resource release completion notification 4005 from the client 2100a, and updates the resource management DB 2020, meaning that the sets of the key information associated with the client 2100a are deleted. Following the updating of the resource management DB 2020, the resource manager 2010 restores the current volume in the key information related to the client 2100b, whose data transfer bandwidth has been reduced, to the state before the reduction and accordingly reduces the valid period in the key information. Note that the resource manager 2010 stores the value of the original current volume when the data transfer bandwidth used by the client 2100b is reduced. Thus, the resource manager 2010 can restore the current volume back to the original by referring to the stored value.

Detailed Description Text (80):
After updating the resource management DB 2020, the resource manager 2010 sends a bandwidth restore notification 4041 to the client 2100b.

Detailed Description Text (81):
Upon receipt of the notification 4041, the client 2100b sends a bandwidth change request 40220 to the server 2200b. In response to the bandwidth change request 40220, the server 2200b adjusts the data transfer bandwidth to the current volume by referring to the resource management DB 2020, and sends a bandwidth change notification 40230 to the client 2100b. Note that the series of operations performed on the client 2100b from receiving the bandwidth restore notification 4041 to receiving the bandwidth change notification 40230 is basically the same as the series of operations performed on the client 2100b from receiving the bandwidth change request 4021 to receiving the bandwidth change notification 4023.

Detailed Description Text (82):
Accordingly, the client 2100b, whose data transfer bandwidth was reduced so as to have another

client use the resource, is now able to use the resource with the original data transfer bandwidth after the other client has finished using the resource.

Detailed Description Text (84):
While the client 2100b is using the resource, with the valid period being t1 and the data transfer bandwidth being 60 MB/s, the resource manager 2010 controls at the time t0 so that the data transfer bandwidth used by the client 2100b is reduced to 30 MB/s in order to allow the client 2100a to use the resource. After the client 2100a has finished using the resource, the resource manager 2010 restores the bandwidth used by the client 2100b to 60 MB/s and also reduces the valid period t2 that was obtained by extending the original valid period (see FIG. 12). Under the control of the resource manager 2010, the current volume and the valid period are changed as shown in FIG. 17.

Detailed Description Text (86):
The following is a description of a second modification of the non-linear editing system 1000, with reference to FIG. 18. In the first embodiment and first modification, a client issues a resource use request to the resource manager 2010 immediately before using the resource. In the second modification, meanwhile, a client can make a reservation for using a resource beforehand.

Detailed Description Text (87):
The resource manager 2010 manages a schedule for each resource in the second modification. Thus, the resource management DB 2020 includes a resource management timetable for each resource as information to manage reserved time periods (including the start and end times) for which the clients will be using the resource.

Detailed Description Text (88):
FIG. 18 shows an example of a representation of a resource management timetable included in the resource management DB 2020 in the second modification. The resource management timetable shown in FIG. 18 is used for managing the schedules of an RS-422 communication interface, a CODEC for encoding signals and decoding data, a hard disk drive (HDD), and a network card that are used by the clients. Note that double-headed arrows drawn in solid lines, dashed lines, one-dot chain lines, and two-dot chain lines respectively indicate time periods during which the different clients will use the resource. To be more specific, the type of line specifies the client.

Detailed Description Text (89):
For the management of the schedule of the resource, each client adds information regarding a start time to use the resource to the resource request information 2500 (see FIG. 6) when issuing a resource use request to the resource manager 2010. By referring to the information regarding the start time and the valid period, the period for which the client will be using the resource can be determined. The resource manager 2010 updates the resource management timetable of the resource management DB 2020 every time it receives the resource use request from a client.

Detailed Description Text (90):
When judging, in response to the reservation request from the client, that the client will be able to use the resource during the requested period, the resource manager 2010 generates the key information as stated and sends a message to the client that the reservation has been made. Then, when the start time comes, the resource manager 2010 links the generated key information with the resource management information and notifies the client of the key ID. Accordingly, the client that has issued the reservation request obtains authorization to use the resource when the start time comes.

Detailed Description Text (91):
If the periods requested by the clients happen to coincide with each other, the resource manager 2010 makes an adjustment in accordance with the acquisition priority and the use continuation priority in the resource request information of each client. A detailed explanation is given as follows. Upon receipt of a reservation request from a client, the resource manager 2010 judges whether the requested period coincides, even partially, with the period that has been requested by another client by referring to the resource management timetable of the DB 2020. If so, the resource manager 2010 compares the acquisition priority and use continuation priority between the two clients, and determines which client should use

the resource in the requested period according to the predetermined criteria. After the determination, the resource manager 2010 sends a message to the corresponding client that the reservation cannot be accepted or that the reservation has been canceled.

Detailed Description Text (93):
(1) In the present embodiment, the resource manager 2010 is an application program that runs under the multitask OS. However, the resource manager 2010 is not limited to this, and may be a system program serving as a part of the OS. Although a server executes the data transfer using one resource in the present embodiment, the server may use a plurality of resources. Also, a resource may be used by all of the provided servers. Suppose that the data transfer is executed by the plurality of servers using a resource, such as the PCI bus, by adjusting each data transfer bandwidth during the execution. In this case, a common rule is set beforehand regarding the transfer timing, so that the data transfer is controlled according to the common rule. For example, the data transfer may be executed in units of packets each including a predetermined amount of data, and the time sequence may be divided into a plurality of time slots in accordance with synchronous signals. With this, the server selects the corresponding number of time slots to use, so that the data transfer bandwidth can be adjusted.

Detailed Description Text (96):
The server itself may refer to the valid period in the key information, and release the resource when the valid period has been expired. With this, when a client and server are independent of each other and they are treated as independent tasks under the control of the multitask OS, the server will release the resource after the expiration of the valid period if an error occurs to the client. Thus, a resource use request from another client is prevented from being refused and the other client can readily use the resource after the release of the resource by the server.

Detailed Description Text (97):
(2) In the present embodiment, the PCI bus 1040 that has a limit to the data transfer bandwidth is used as a main example of resources. For this reason, each of the maximum and minimum volumes in the resource request information is indicated by a value representing the data transfer bandwidth. However, when a resource has a limit simply in number, the maximum and minimum volumes may indicated by the number. Also, when a resource is a single unit, they may be indicated as "no need to specify." In the case of the resource that has a limit in number, the resource manager 2010 sends a number change request to the client instead of the bandwidth change request 4021 described in the present embodiment.

Detailed Description Text (98):
In the present embodiment, when a client issues a request to use a resource while another client is using the resource, the resource manager 2010 reduces the current volume by the client currently using the resource as necessary. However, there may be a case where the resource manager 2010 sends a message to the client using the resource to release the resource in accordance with the acquisition priority and the use continuation priority.

Detailed Description Text (99):
(3) In the present embodiment, the resource manager 2010 sends the key ID of the key information to the client as authorization to use the resource. However, the way of giving authorization to the client according to the present invention is not limited to this. For example, the client may be given authorization when the resource manager 2010 links the key information with the resource management information without sending the key ID to the client. In this case, the server may receive the client ID and then gain access to necessary key information specified by the client ID.

Detailed Description Text (100):
(4) In the present embodiment, the resource manager 2010 judges whether the valid period of the key information has been expired by referring to the resource management DB 2020 and, if it has been expired, sends the period expiration notification 4011 to the client. However, the client itself may comprehend the valid period when receiving the key ID as authorization to use the resource. For doing so, the client may receive information of the valid period together with the key ID from the resource manager 2010. When the valid period has been expired, the client may stop using the resource by controlling the server.

Detailed Description Text (101):

(5) In the present embodiment, a client issuing a resource use request specifies a valid period as a set of information included in the resource request information. The valid period may refer to a period that is valid only when the maximum volume specified together with the valid period is available. In this case, the resource manager 2010 may change the valid period of the key information, i.e., the time period for which the client is given authorization to use the resource, in accordance with the volume that allows the client to use.

Detailed Description Text (102):
Alternatively, the resource manager 2010 may receive information from the client about the total amount of data that the client is to transfer. The resource manager 2010 may set the authorized valid period for the client to use the resource in accordance with this information and the volume judged to be available for the client.

Detailed Description Text (103):
(6) In the present embodiment, a client issuing a resource use request specifies its acquisition priority and use continuation priority as sets of information included in the resource request information. However, the acquisition priority and use continuation priority may be set beforehand for each client. The resource manager 2010 may store these sets of information for each client and refers to them instead of the resource request information.

Detailed Description Text (104):
(7) Although the resource manager 2010 sends a key ID specifying key information generated in the resource management DB 2020 to the client in the present embodiment, the key information itself may be sent to the client. In this case, the client may sends the key information to the server, which then executes data transfer according to the key information.

Detailed Description Text (105):
(8) A description has been given in the present embodiment for a case where the system for managing the resources is connected to one PC. The present invention is not limited to such a system, and may be applied to a system that centralizes the management of resources distributed on a network using one resource manager.

Detailed Description Text (106):
FIG. 19 shows an example of a system that centralizes the management of resources distributed on a network using one resource manager. As shown in FIG. 19, network terminals 5003 and 5004 using which the user performs an editing operation, a non-linear editing apparatus 5001, and a video server with resource managing device 5002 are connected to each other on the network. Note that the video server with resource managing device 5002 has a function of the resource manager 2010 described in the present embodiment.

Detailed Description Text (107):
A plurality of systems each having the same construction as the non-linear editing system 1000 described in the present embodiment may be connected on the network. With this network connection, a client belonging to a non-linear editing system may gain access to a resource belonging to another non-linear editing system. The procedures executed in this case is explained below.

Detailed Description Text (108):
A client sends a resource use request together with information about resource acquisition condition, acquisition period, and resource type to a resource manager of the nonlinear editing system to which the client belongs. When receiving this request and information, the resource manager first judges whether any of its own resources is available. If there is no resource available, the resource manager then sends the resource use request to each resource manager of all the other non-linear editing systems, requesting to use a resource. In response to the request, each resource manager judges whether its own resource corresponding to the requested resource type can be used. If judging so, the resource manager generates key information and sends a key ID notification indicating the location of the key information to the resource manager which sent the request to all the other resource managers. When receiving more than one key ID notification, the resource manager sends the first one to the client. In accordance with the received key ID notification, the client requests the server of the other non-linear editing system that has accepted the request for the execution of data transfer via the resource.

Detailed Description Text (109):
Following these procedures, the client can use a necessary resource that belongs to another system on the network.

Detailed Description Text (110):
(9) In the present embodiment, a client issuing a resource use request specifies its acquisition priority and use continuation priority as one of the four levels. However, the number of levels are not limited to four. Alternatively, information about the acquisition priority and use continuation priority may be omitted. In this case, when more than one client issues a resource use request for the same resource, the first client to send the request takes top priority over the other clients. The requests issued by the other clients may be refused or processed in order after the first client has finished using the resource.

Detailed Description Text (111):
(10) Although the messages are sent/received among a client, server, and resource manager, the transfer of messages is not particularly limited to be executed by means of the interprocess communication using addresses or handles. The messages may be sent/received in another way as long as information included in the messages can be reliably transferred.

Detailed Description Text (112):
(11) In the first modification of the present embodiment, when the data transfer bandwidth used a client having been using a resource is reduced since another client has requested for the resource, the bandwidth is restored (i.e., increased) after the other client has finished using the resource. However, the bandwidth used by the previous client may be restored before the other client finishes using the resource. To be more specific, the available bandwidth will be changed with the passage of time and, therefore, when the available bandwidth is judged to be increased, the bandwidth used by the previous client may be restored or increased exceeding the original bandwidth.

Detailed Description Text (115):
The digital video reproducing/recording apparatus is composed of a video reproduction/recording executing unit 110, a hardware resource managing unit 120, and a hardware controlling unit 130. The video reproduction/recording executing unit 110 is equipped with hardware resources.

Detailed Description Text (119):
The hardware resource managing unit 120 is composed of a hardware resource storing unit 121, a hardware resource allocation authorizing unit 123 including a hardware resource release requesting unit 122, and a hardware resource release receiving unit 124.

Detailed Description Text (120):
The hardware resource storing unit 121 is made up of a RAM or the like, and stores each state of the hardware resources provided for the video reproduction/recording executing unit 110. Here, the hardware resources refer to the two channels of the hard disk 111, the CODEC I 112, and the CODEC II 113.

Detailed Description Text (121):
FIG. 21 shows an initial state of a hardware resource management table 201 stored in the hardware resource storing unit 121.

Detailed Description Text (122):
The hardware resource management table 201 shows a hardware type 202, a hardware resource 203, a flag 204, and a process name 205. The hardware type 202 indicates a device provided for the video reproduction/recording executing unit 110. The hardware resource 203 indicates a hardware resource to be used by the video reproduction/recording executing unit 110. To be more specific, as shown in the table 201, the hard disk 111 can process video data using its two channels, one CODEC as the CODEC I 112 is used both for recording and reproducing the video data, and another CODEC as the CODEC II 113 is used only for reproducing the video data.

Detailed Description Text (123):
The flag 204 indicates "allocated" when the hardware resource shown in the hardware resource 203 is currently being used and "unallocated" when it is not currently being used. The process name 205 indicates, when the hardware resource is currently being used, a process name depending on how the hardware resource is being used, that is, whether it is used in the

recording or reproducing process. Note that the hardware resource management table 201 in FIG. 21 shows its initial state and, therefore, each column of the process name 205 is left blank.

Detailed Description Text (124):
The hardware resource allocation authorizing unit 123 stores the process name and the necessary hardware resources when receiving the notification of a process to be executed from the hardware controlling unit 130. The hardware resource allocation authorizing unit 123 then judges whether the hardware resources to be used in the process can be allocated, by referring to the hardware resource management table 201 stored in the hardware resource storing unit 121. As described later, there are maximum and minimum number of resources to be used in each process. More specifically, the maximum number of resources indicates a desirable number of resources used in the process while the minimum number of resources indicates the number of resources that are required for the process at the minimum. Thus, the hardware resource allocation authorizing unit 123 first judges whether the maximum number of resources can be allocated to the requested process and, if not, next judges whether the minimum number of resources can be allocated. If each flag 204 associated with the requested hardware resources is indicated as "unallocated" in the table 201, the hardware resource allocation authorizing unit 123 judges that the maximum or minimum number of resources can be allocated to the requested process.

Detailed Description Text (125):
When receiving the notification from the hardware resource release receiving unit 124 that a change has been made to the hardware resource management table 201, the hardware resource allocation authorizing unit 123 judges once again whether the hardware resources currently requested for the execution of the process can be still allocated.

Detailed Description Text (126):
If judging that the requested hardware resources can be allocated, the hardware resource allocation authorizing unit 123 sets each flag 204 associated with these hardware resources as "allocated" as well as writing the name of process into the process name 205. Following this, the authorizing unit 123 sends an authorization notification to the hardware controlling unit 130. Here, the hardware controlling unit 130 is also notified of whether the authorizing unit 123 has authorized the maximum or minimum number of resources to be allocated to the process.

Detailed Description Text (127):
Meanwhile, if judging that the requested hardware resources cannot be allocated, the authorizing unit 123 first keeps the allocation of the minimum number of resources to the process that is currently being executed and then judges whether the remaining hardware resources (i.e., the resources remaining after subtracting the minimum number from the maximum number of resources allocated to the currently-executed process) can serve the requested process.

Detailed Description Text (128):
If judging that the remaining hardware resources cannot serve the requested process, the authorizing unit 123 notifies the hardware controlling unit 130 that the hardware resources cannot be allocated to the requested process.

Detailed Description Text (129):
If the remaining hardware resources are judged to serve the requested process, the hardware resource release requesting unit 122 notifies the hardware controlling unit 130 of the name of the process that is currently being executed and of the hardware resources that need to be released.

Detailed Description Text (130):
The hardware resource release receiving unit 124 receives the notification that some of the hardware resources used in the currently-executed process have been released or the notification that this process has ended. Upon receipt of the notification, the hardware resource release receiving unit 124 sets each flag 204 associated with the released hardware resources as "unallocated" in the hardware resource management table 201 stored in the hardware resource storing unit 121. Also, the receiving unit 124 deletes the process name 205 corresponding to the flag 204 indicated as "unallocated." After this, the receiving unit 124 sends the hardware resource allocation authorizing unit 123 a notification that the hardware resource management table 201 has been updated.

Detailed Description Text (131):
Upon receiving a request from the user for the execution of a process, the hardware controlling unit 130 sends a notification of the requested process to the hardware resource allocation authorizing unit 123 of the hardware resource managing unit 120. A process referred to here is a reproducing process 131 or a recording process 132.

Detailed Description Text (132):
The reproducing process 131 includes a necessary hardware resource 133 and a hardware control process description 134. The recording process 132 includes a necessary hardware resource 135 and a hardware control process description 136.

Detailed Description Text (133):
FIG. 22A shows a list example of the necessary hardware resource 133 of the reproducing process 131. A list 301 of FIG. 22A shows a maximum number of resources 302 and a minimum number of resources 303 that are required as the necessary hardware resource 133. The maximum number of resources 302 indicates the number of resources that are used at the maximum in the reproducing process 131. In other words, in a case where the reproducing process 131 uses the maximum number of resources, all the resources provided for the video reproduction/recording executing unit 110 and shown in a hardware type 304 are used. Meanwhile, the minimum number of resources 303 indicates the number of resources that are required at the minimum for the reproducing process 131.

Detailed Description Text (135):
FIG. 22B shows a list example of the hardware control process description 134 of the reproducing process 131. A list 305 of FIG. 22B describes how the hardware controlling unit 130 controls the units 111 to 117 of the video reproduction/recording executing unit 110 so that the reproducing process 131 is normally executed. The list 305 includes descriptions 306 and 307 respectively corresponding to the maximum number of resources 302 and the minimum number of resources 303. Each of the descriptions 306 and 307 describes how to control the units 111 to 117 of the video reproduction/recording executing unit 110.

Detailed Description Text (136):
A detailed explanation is given for a case where the hardware resources are used at the maximum, by referring to the description 306. The two channels of the hard disk 111 are set for the reproducing process 131, and video data is read from the hard disk 111. Each of the CODEC I 112 and the CODEC II 113 is set as a decoder and so decodes the video data outputted from the corresponding channel. The switch 114 is set so as to establish a connection between the CODEC I 112 and the MIX circuit 115. The MIX circuit 115 is set so as to pass the two sets of video data that are respectively outputted from the CODEC I 112 and the CODEC II 113. The D/A converter 116 is set so as to convert the digital video data outputted from the MIX circuit 115 into analog video data. The A/D converter 117 is not required in the present recording process 131 and so indicated as "Don't Care."

Detailed Description Text (137):
Next, a detailed explanation is given for a case where the hardware resources are used at the minimum, by referring to the description 307. One channel of the hard disk 111 is set for the reproducing process 131, and video data is read from the hard disk 111. The CODEC I 112 is not required in the current process and so indicated as "Don't Care." The CODEC II 113 is set as a decoder and so decodes the read video data. The switch 114 and the A/D converter 117 are not required in the present reproducing process 131. The MIX circuit 115 is set so as to pass only the video data outputted from the CODEC II 113. The D/A converter 116 is set so as to convert the digital video data outputted from the MIX circuit 115 into analog video data.

Detailed Description Text (138):
When one-channel reproduction is executed as another reproducing process, the same number as the minimum number of resources 303 in the case of two-channel reproduction is indicated as the maximum number of resources 302 in the list 301 for one-channel reproduction. Therefore, the same descriptions as the description 307 in the case of two-channel reproduction are shown in the description 306 in the list 305 for one-channel reproduction.

Detailed Description Text (139):
FIG. 23A shows a list example of the necessary hardware resource 135 of the recording process

132. A list 401 of FIG. 23A shows a maximum number of resources 402 and a minimum number of resources 403 that are required as the necessary hardware resource 135. The numbers indicated as the maximum and minimum numbers of resources 402 and 403 are the same for each hardware resource. For the recording process 132, one channel of the hard disk 111 and the CODEC I 112 of the video reproduction/recording executing unit 110 are absolutely necessary. This is to say, the recording process 132 cannot be executed without any of these hardware resources. However, the recording process 132 does not require any more channel of the hard disk 111.

Detailed Description Text (140):
FIG. 23B shows a list example of the hardware control process description 136 of the recording process 132. A list 405 of FIG. 23B describes how the hardware controlling unit 130 controls the units 111 to 117 of the video reproduction/recording executing unit 110 during the execution of the recording process 132. The list 405 includes descriptions respectively corresponding to the maximum number of resources 402 and the minimum number of resources 403. As stated above, since the maximum and minimum numbers of the resources 402 and 403 are the same, the descriptions are also the same for each case.

Detailed Description Text (142):
Upon receipt of an authorization notification from the hardware resource allocation authorizing unit 123 that the requested hardware resources can be allocated, the hardware controlling unit 130 controls the units 111 to 117 of the video reproduction/recording executing unit 110 according to the hardware control process description 134 or 136 in order to execute the reproducing process 131 or the recording process 132 that is requested by the user. The number of hardware resources (the maximum or minimum number) to be used is notified in the authorization notification from the hardware resource allocation authorizing unit 123.

Detailed Description Text (143):
On completion of the reproducing process 131 or the recording process 132 by the video reproduction/recording executing unit 110, the hardware controlling unit 130 notifies the hardware resource release receiving unit 124 of the name of the process that has completed.

Detailed Description Text (144):
When receiving the notification that the currently-executed process should be suspended and some of the resources having been allocated to this process should be released, the hardware controlling unit 130 suspends the execution of the process and also stops the use of the notified hardware resources. Then, the hardware controlling unit 130 resumes the suspended process by controlling the remaining hardware resources.

Detailed Description Text (145):
Meanwhile, when receiving the notification from the hardware resource allocation authorizing unit 123 that the requested hardware resources cannot be allocated, the hardware controlling unit 130 has a display unit (not illustrated) display a message to notify the user that the requested process cannot be executed.

Detailed Description Text (146):
Next, a detailed operation to be performed by the hardware resource managing unit 120 for allocating the hardware resources is explained with reference to the contents stored in the hardware resource storing unit 121.

Detailed Description Text (147):
Suppose that the hardware resource management table 201 as shown in FIG. 21 is stored now in the hardware resource storing unit 121, and that the hardware resource allocation authorizing unit 123 receives a request from the hardware controlling unit 130 for the execution of the reproducing process 131 based on the list 301 (see FIG. 22A). In this case, the maximum number of resources can be allocated as the necessary hardware resources 302 to the reproducing process 131. Thus, the table 201 is updated to a hardware resource management table 501 as shown in FIG. 24, and the hardware controlling unit 130 receives an authorization notification from the authorizing unit 123.

Detailed Description Text (148):
With this state, suppose that the hardware resource allocation authorizing unit 123 receives a request from the hardware controlling unit 130 for the execution of the recording process 132 based on the list 401 (see FIG. 23A). In this case, since each flag of the channels, the CODEC

I 112, and the CODEC II 113 is indicated as "allocated," the authorizing unit 123 judges that the hardware resources cannot be allocated to the recording process 132. Then, the authorizing unit 123 refers to the minimum number of resources as the necessary hardware resources used for the reproducing process 131 and judges that the hardware resources can be allocated to the recording process 132 by changing the current number of resources used in the reproducing process 131 to the minimum number. The hardware resource release requesting unit 122 requests the hardware controlling unit 130 to stop using one channel of the hard disk 111 and the CODEC I 112 that are currently being used in the reproducing process 131. In response to this request, the hardware controlling unit 130 stops the use of them and notifies the hardware resource release receiving unit 124 so. Thus, the table 501 is updated to a hardware resource management table 601 as shown in FIG. 25.

Detailed Description Text (149):
With the contents of the hardware resource management table 601, the recording process 132 can be authorized to be executed. Therefore, the hardware resource allocation authorizing unit 123 updates the table 601 to a hardware resource management table 701, and also notifies the hardware controlling unit 130 that the reproducing process 132 can be resumed.

Detailed Description Text (151):
Accordingly, the hardware resource managing unit 120 supervises the state of use of each hardware resource of the video reproduction/recording executing unit 110. As a result, each hardware resource can be effectively used.

Detailed Description Text (153):
FIG. 28 is a flowchart of an operation performed by the hardware resource managing unit 120.

Detailed Description Text (154):
First, the hardware resource allocation authorizing unit 123 receives a request from the hardware controlling unit 130 for the execution of the reproducing process 131 or the recording process 132 together with the corresponding necessary hardware resources 133 or 135 (step S902). The authorizing unit 123 stores the name of the requested process and the necessary hardware resources (step S904). Then, the authorizing unit 123 sets the maximum number of resources as the necessary hardware resources to be used in the requested process (step S906).

Detailed Description Text (155):
The authorizing unit 123 judges whether the maximum number of hardware resources can be allocated to the requested process, by referring to the hardware resource management table stored in the hardware resource storing unit 121 (step S908). If so ("Y" in step S908), each flag of the hardware resources to be used is set as "allocated" and the name of the requested process is written for each hardware resource in the hardware resource management table (step S910). The authorizing unit 123 notifies the hardware controlling unit 130 of authorization to use the hardware resources for the requested process and of the hardware resources to be used in the requested process (step S912). Here, the operation by the hardware resource managing unit 120 is terminated.

Detailed Description Text (156):
Meanwhile, if judging that the necessary hardware resources cannot be allocated to the requested process ("N" in step S908), the authorizing unit 123 next judges whether the number of the hardware resources having been set for the execution of the requested process exceeds the minimum number of resources (step S914). If judging so ("Y" in step S914), the authorizing unit 123 reduces the number of hardware resources to be used in the process (step S916), and then returns to step S908.

Detailed Description Text (157):
When judging that the number of hardware resources having been set is the minimum number in step S914, the authorizing unit 123 next judges whether the number of resources used in the process that is currently being executed is the maximum number as the necessary hardware resources (step S918). If not ("N" in step S918), the authorizing unit 123 informs the hardware controlling unit 130 that the hardware resources cannot be allocated to the requested process. On the other hand, if judging the number of resources used in the currently-executed process is the maximum number ("Y" in step S918), the authorizing unit 132 next judges whether, if the number of resources used in the currently-executed process is reduced to the minimum number, the remaining hardware resources can serve the requested process (step S922).

Detailed Description Text (158):
If not ("N" in step S922), the authorizing unit 132 proceeds to step S920 where it informs the hardware controlling unit 130 that the hardware resources cannot be allocated to the requested process. Here, the operation is terminated. Meanwhile, if the remaining hardware resources are judged to serve the requested process ("Y" in step S922), the hardware resource release requesting unit 122 requests the hardware controlling unit 130 to release the related hardware resources that are being used in the currently-executed process (step S924).

Detailed Description Text (159):
Upon receipt of the notification from the hardware controlling unit 130 that the related hardware resources have been released ("Y" in step S926), the hardware resource release receiving unit 124 updates the hardware resource management table stored in the hardware resource storing unit 121 (step S928). Then, the operation returns to step S908.

Detailed Description Text (161):
Upon receiving a request for the execution of a process from the user, the hardware controlling unit 130 informs the hardware resource allocation authorizing unit 123 of the name of the requested process (step S1002). The hardware controlling unit 130 then judges whether the authorizing unit 123 has authorized the hardware resources to be used for the requested process (step S1004). If receiving a notification that the hardware resources cannot be used ("N" in step S1004), the hardware controlling unit 130 has the display unit (not illustrated) display a message to notify the user that the requested process cannot be executed (step S1006). Here, the present operation is terminated.

Detailed Description Text (162):
If judging that the hardware resources have been authorized by the authorizing unit 123 ("Y" in step S1004), the hardware controlling unit 130 controls the video reproduction/recording executing unit 110 according to each hardware control process description associated with the hardware resources to be used in the requested process (step S1008). The hardware controlling unit 130 controls the executing unit 110 until the end of the present process (step S1010). On completion of the present process, the hardware controlling unit 130 informs the hardware resource release receiving unit 124 of the hardware resources that have been used in that process (step S1012), and terminates the present operation.

Detailed Description Text (163):
An explanation is next given to an operation performed by the hardware controlling unit 130 when receiving an interruption request to release the hardware resources, with reference to the flowchart of FIG. 30.

Detailed Description Text (164):
Upon receipt of an interruption request from the hardware resource release requesting unit 122 to release the hardware resources ("Y" in step S1102), the hardware controlling unit 130 suspends the currently-executed process and stops using the requested hardware resources (step S1104). Following this, the hardware controlling unit 130 informs the hardware resource release receiving unit 124 of the released hardware resources (step S1106). Then, the hardware controlling unit 130 resumes the suspended process by controlling the remaining hardware resources allocated to the suspended process (step S1108). Accordingly, the operation performed for the interruption request is terminated.

Detailed Description Text (167):
FIG. 31 shows a construction of a hardware resource managing unit of a digital video reproducing/recording apparatus of a third embodiment of the present invention.

Detailed Description Text (168):
A hardware resource managing unit 1201 includes storing units that respectively store the contents of the hardware resource management table that is stored in the hardware resource storing unit 121 provided in the hardware resource managing unit 120 of the second embodiment. It should be noted here that a video reproduction/recording executing unit 110 and a hardware controlling unit 130 of the third embodiment are the same as those described in the second embodiment. Therefore, explanations for these units are omitted in the present embodiment.

Detailed Description Text (169):

As shown in FIG. 31, the hardware resource managing unit 1201 is composed of an all-resource storing unit 1202, a hardware resource allocation authorizing unit 1204 that includes a hardware resource release requesting unit 1203, an unallocated hardware resource storing unit 1205, an allocated hardware resource storing unit 1206, and a hardware resource release receiving unit 1207.

Detailed Description Text (170):
The all-resource storing unit 1202 is made up of a ROM or the like, and stores the hardware resources that are provided for the video reproduction/recording executing unit 110 and used in the processes.

Detailed Description Text (171):
FIG. 32 shows contents stored in the all-resource storing unit 1202. A hardware type 1301 indicates a name of a hardware resource while a hardware resource 1302 indicates the number of the hardware resources.

Detailed Description Text (172):
When the digital video reproducing/recording apparatus is activated, the hardware resource allocation authorizing unit 1204 has the unallocated hardware resource storing unit 1205 store the contents stored in the all-resource storing unit 1202.

Detailed Description Text (173):
The hardware resource storing unit 1205 is made up of a RAM or the like, and stores hardware resources that are currently unallocated. Immediately after its own activation, the unallocated hardware resource storing unit 1205 stores the same contents as shown in FIG. 32.

Detailed Description Text (174):
Upon receipt of a notification from the hardware controlling unit 130 of a requested process name and necessary hardware resources, the hardware resource allocation authorizing unit 1204 stores them. Following this, the authorizing unit 1204 judges whether the hardware resources counted in the maximum or minimum number of resources to be used as the necessary hardware resources are stored in the unallocated hardware resource storing unit 1205. If they are, the authorizing unit 1204 deletes the related hardware resources from the unallocated hardware resource storing unit 1205. The authorizing unit 1204 then writes the related hardware resources into the allocated hardware resource storing unit 1206 as well as having the storing unit 1206 store the requested process name. After this, the authorizing unit 1204 informs the hardware controlling unit 130 that the related hardware resources have been authorized to be used in the requested process.

Detailed Description Text (175):
Meanwhile, suppose that the hardware resources counted in the minimum number of resources used as the necessary hardware resources are not stored in the unallocated hardware resource storing unit 1205. In this case, the authorizing unit 1204 judges whether, if the number of hardware resources that are being used for the currently-executed process and stored in the allocated hardware resource storing unit 1206 is reduced, the minimum number of hardware resources required for the requested process can be allocated.

Detailed Description Text (176):
If it is judged that the minimum number of hardware resources cannot be allocated to the requested process, the authorizing unit 1204 notifies the hardware controlling unit 130 that the requested process cannot be executed.

Detailed Description Text (177):
If the minimum number of hardware resources is judged to be allocated, on the other hand, the hardware resource release requesting unit 1203 informs the hardware controlling unit 130 of the hardware resources required for the requested process and also requests the controlling unit 130 to release these hardware resources that are currently being used.

Detailed Description Text (178):
The allocated hardware resource storing unit 1206 is made up of a RAM or the like, and stores a name of the currently-executed process and the hardware resources that are currently being used in that process under the control of the hardware controlling unit 130.

Detailed Description Text (179):
As one example, suppose that one-channel reproduction as a reproducing process is currently being executed by the video reproduction/recording executing unit 110. In this case, the allocated hardware resource storing unit 1206 stores the contents shown in FIG. 33A. Here, the contents stored in the unallocated hardware resource storing unit 1205 has been updated from the contents shown in FIG. 32 to the contents shown in FIG. 33B.

Detailed Description Text (180):
Upon receiving a notification from the hardware controlling unit 130 of a requested process name (in this case, the recording process) and the necessary hardware resources, the authorizing unit 1204 refers to the contents (shown in FIG. 33B) stored in the unallocated hardware resource storing unit 1205 and informs the hardware controlling unit 130 that the recording process can be executed using the hardware resources. Thus, the contents stored in the allocated hardware resource storing unit 1206 are updated to contents shown in FIG. 34A. The contents stored in the unallocated hardware resource storing unit 1205 are updated and blanked as shown in FIG. 34B.

Detailed Description Text (181):
The hardware resource release receiving unit 1207 receives a notification from the hardware controlling unit 130 of the hardware resources that have been released and the name of the suspended process, or a notification of the name of the process that has just ended and the hardware resources that have been accordingly released. On receipt of this notification, the hardware resource release receiving unit 1207 deletes the related hardware resources and the process name from the contents stored in the allocated hardware resource storing unit 1206. The receiving unit 1207 then writes these hardware resources into the unallocated hardware resource storing unit 1205.

Detailed Description Text (182):
When both the reproducing process (one-channel reproduction) and the recording process have been finished by the video reproduction/recording executing unit 110, the contents stored in the allocated hardware resource storing unit 126 are blanked. Simultaneously, the contents stored in the unallocated hardware resource storing unit 1205 returns to the initial state shown in FIG. 32.

Detailed Description Text (183):
In the second embodiment, the hardware resource allocation authorizing unit 123 judges whether a hardware resource is allocated or unallocated by referring to the flag in the hardware resource management table stored in the hardware resource storing unit 121. In the present embodiment, meanwhile, the authorizing unit 1204 can make this judgement by referring to the contents stored in the unallocated hardware resource storing unit 1205. Without using the flags, the hardware resource allocation authorizing unit 1204 and the hardware resource release receiving unit 1207 respectively update the contents stored in the unallocated hardware resource storing unit 1205 and the allocated hardware resource storing unit 1206.

Detailed Description Text (186):
FIG. 35 shows a construction of a hardware resource managing unit of a digital video reproducing/recording apparatus of a fourth embodiment of the present invention.

Detailed Description Text (187):
As shown in FIG. 35, a hardware resource managing unit 1601 is composed of an all-resource storing unit 1602, a hardware resource allocation authorizing unit 1603, an unallocated hardware resource storing unit 1604, and a hardware resource release receiving unit 1605. As is the case with the third embodiment, a video reproduction/recording executing unit 110 and a hardware controlling unit 130 of the fourth embodiment are almost the same as those described in the second embodiment. Therefore, explanations for these units are omitted in the present embodiment. The all-resource storing unit 1602 is the same as the all-resource storing unit 1202 of the third embodiment.

Detailed Description Text (188):
When the digital video reproducing/recording apparatus is activated, the hardware resource allocation authorizing unit 1603 has the unallocated hardware resource storing unit 1604 store the contents stored in the all-resource storing unit 1602.

Detailed Description Text (189):
Upon receipt of a notification from the hardware controlling unit 130 of a requested process and necessary hardware resources, the authorizing unit 1603 judges whether these hardware resources can be allocated to the requested process. If judging so, meaning that these hardware resources are stored in the unallocated hardware resource storing unit 1604, the authorizing unit 1603 deletes the hardware resources from the contents stored in the unallocated hardware resource storing unit 1604. Thus, the authorizing unit 1603 informs the hardware controlling unit 130 that the requested process can be executed using the necessary hardware resources. On the other hand, if the notified necessary hardware resources are not stored in the unallocated hardware resource storing unit 1604, the authorizing unit 1603 informs the hardware controlling unit 130 that the requested process cannot be executed.

Detailed Description Text (190):
The unallocated hardware resource storing unit 1604 is made up of a RAM or the like, and stores the hardware resources that are not currently being used.

Detailed Description Text (191):
Upon receiving a notification from the hardware controlling unit 130 of the name of the process that has been finished and the hardware resources that have been accordingly released, the hardware resource release receiving unit 1605 writes the notified hardware resources into the unallocated hardware resource storing unit 1604.

Detailed Description Text (192):
Immediately after the digital video reproducing/recording apparatus has been activated, the unallocated hardware resource storing unit 1604 stores the same contents as shown in FIG. 32. With this initial state, suppose that the hardware resource allocation authorizing unit 1603 receives a request from the hardware controlling unit 130 for one channel of the hard disk 111 and the CODEC II 113 (reproduce-only device) to execute one-channel reproduction as a reproducing process. In this case, the authorizing unit 1603 deletes these hardware resources from the contents of the unallocated hardware resource storing unit 1604 and so updates the contents as shown in FIG. 33A. Also, the authorizing unit 1603 informs the hardware controlling unit 130 that one-channel reproduction can be executed using the necessary hardware resources.

Detailed Description Text (193):
With this state, next suppose that the authorizing unit 1603 receives a request from the hardware controlling unit 130 for one channel of the hard disk 111 and the CODEC I 112 (record-only device) so as to execute the recording process. In this case, since these hardware resources are stored in the unallocated hardware resource storing unit 1604, the authorizing unit 1603 deletes these resources from the contents and informs the controlling unit 130 that the recording process can be executed using the necessary hardware resources. Thus, the contents of the unallocated hardware resource storing unit 1604 are blanked as shown in FIG. 34B. After receiving the notification from the hardware controlling unit 130 that the processes have been finished by the video reproduction/recording executing unit 110 and the related hardware resources have been released, the authorizing unit 1603 writes these notified hardware resources into the unallocated hardware resource storing unit 1604. Thus, the contents return to the initial state as shown in FIG. 32.

Detailed Description Text (194):
Next, an operation performed by the hardware resource managing unit 1601 is explained with reference to the flowchart shown in FIG. 36.

Detailed Description Text (195):
Upon activation of the digital video reproducing/recording apparatus, the hardware resource allocation authorizing unit 1603 writes the hardware resources, that are provided for the video reproduction/recording executing unit 110 and stored in the contents of the all-resource storing unit 1602, into the unallocated hardware resource storing unit 1604 (step S1702).

Detailed Description Text (196):
The authorizing unit 1603 judges whether hardware resources are requested by the hardware controlling unit 130 (step S1704). If not ("IN" in step S1704), the authorizing unit 1603 next judges whether the hardware resource release receiving unit 1605 has received a notification from the hardware controlling unit 130 that the use of the hardware resources has been finished (step S1706). If not ("N" in step S1706), the authorizing unit 1603 returns to step S1704.

Meanwhile, if receiving the notification ("Y" in step S1706), the hardware resource release receiving unit 1605 writes the notified hardware resources into the unallocated hardware resource storing unit 1604 (step S1708), and returns to step S1704.

Detailed Description Text (197):
If judging that the hardware resources to be used have been notified in step S1704, the authorizing unit 1603 next judges whether the notified hardware resources are stored in the unallocated hardware resource storing unit 1604 (step S1710). If they are ("Y" in step S1710), the authorizing unit 1603 sends an authorization notification to the hardware controlling unit 130, i.e., notifies that the notified hardware resources can be used (step S1712) and returns to step S1704. If they are not stored in the unallocated hardware resource storing unit 1604 ("N" in step S1710), the authorizing unit 1603 notifies the hardware controlling unit 130 that the notified hardware resources cannot be used (step S1714) and returns to step S1704.

Detailed Description Text (198):
In the second, third, and fourth embodiments, two channels are used to access the hardware resources of the video reproduction/recording executing unit 110 and thus two CODECs are used in correspondence with the two channels. However, the number of channels or the number of CODECs are not limited to two, and three or more channels and the same number of CODECs may be provided. The hardware resource managing unit may manage the state of use (whether it is used or not) for each channel and each CODEC. With this management, not only can the reproducing process and the recording process be executed in parallel as described in the preceding embodiments, but also that two different reproducing processes can be executed in parallel. Moreover, the real-time format conversion process and the reproducing or recording process can be executed in parallel. In this parallel operation, an encoded format is converted into another encoded format in real time using two CODECs in the real-time format conversion process, while the reproducing or recording process is executed using the remaining CODEC. As another possibility, a rendering process and a reproducing process can be executed in parallel. In the rendering process, video data that has been mixed by a plurality of CODECs and the MIX circuit is re-recorded in real time using another CODEC. Alternatively, two processes out of the rendering, reproducing, and recording processes can be executed in parallel with efficiency.

Detailed Description Text (199):
The construction of the digital video reproducing/recording apparatus is shown in FIG. 20 of the second embodiment, in FIG. 31 of the third embodiment, and in FIG. 35 of the fourth embodiment. However, a program having the functions of the hardware controlling unit and the hardware resource managing unit may be recorded in a computer-readable record medium. This program may used in a digital video reproducing/recording apparatus that cannot dynamically handle reproduction and recording of video data in real time. By means of this program, the same effect can be achieved as in the case of the digital video reproducing/recording apparatus of the present invention.

Detailed Description Text (201):
The following is a description of an example of a resource management system. For this resource management system, the resource manager 2010 and the resource management DB 2020 (see FIG. 5) of the resource management system of the first embodiment are applied to the digital video reproducing/recording apparatus as described in the second to fourth embodiments (see FIG. 20, FIG. 31, and FIG. 35).

Detailed Description Text (202):
Note that the resource management system of the fifth embodiment is different from that of the first embodiment. More specifically, using the system of the fifth embodiment, a client can acquire different types of resources at one time and can release some of the acquired resources and re-acquire the once-released resources. As such, the resource request information that the client sends to the resource manager is reformed so that the client can request for a plurality of resources at one time. Also, new kinds of messages are transferred between the client and the resource manager so as to notify each other of information about the release of some resources and the re-acquisition of the released resources. The following explanation will focus on the differences between the first and fifth embodiments.

Detailed Description Text (203):
FIG. 37 shows hardware resources of the digital video reproducing/recording apparatus of the

fifth embodiment and also shows a data flow when the hardware resources performs a function of digitizing and recording inputted video. This function is referred to as the "digitizer function"hereinafter.

Detailed Description Text (204):
The digital video reproducing/recording apparatus is composed of a hard disk drive 111, a CODEC 112, a CODEC 113, a switch 114, a MIX circuit 115, a D/A converter 116, and an A/D converter 117, as its hardware resources. These hardware resources are the same as those in the second embodiment and, therefore, an explanation for these resources is omitted in the present embodiment. It should be noted here that the resource management DB has resource management information for each hardware resource. However, for convenience of explanation, the fifth embodiment is described on the precondition that the hard disk drive 111 can be always shared. Thus, control regarding authorization to use the hard disk drive 111 is not described in the present embodiment.

Detailed Description Text (211):
As shown in FIG. 39, the digitizer AP first sends a resource use request 6001 including resource request information 6500 to the resource manager. The resource request information 6500 included in the resource use request 6001 is explained with reference to FIG. 40. FIG. 40 shows an example of a data construction and contents of the resource request information 6500 that is referred to when a plurality of resources are requested at one time.

Detailed Description Text (212):
As shown in this figure, the resource request information 6500 includes a client ID 6501, an object resource ID 6502, a number of resources 6503, an acquisition priority 6504, and a use continuation priority 6505. The resource request information 6500 is different from the resource request information 2500 of the first embodiment mainly in that all the contents except the client ID 6501 provide information for each object resource. Although the information about the valid period is omitted in the resource request information 6500, it may be included as in the case of the first embodiment. The number of resources 6503 is indicated by a number of resources to be used in a requested process and not expressed as the volume used out of the capacity of a resource. The number of resources 6503 replaces the maximum volume 2504 and the minimum volume 2505 in the first embodiment. These two different levels in volume in the first embodiment may be also employed in the present embodiment.

Detailed Description Text (213):
The digitizer AP requires one each of the following: the CODEC; switch; MIX circuit; D/A converter; and A/D converter. Thus, the digitizer AP sends the resource use request 6001 including the resource request information 6500 as shown in FIG. 40 to the resource manager.

Detailed Description Text (214):
Upon receipt of the resource use request 6001, the resource manager refers to the resource request information 6500 and the resource management DB, and performs the resource use request receiving process as described in the first embodiment (see in FIG. 8).

Detailed Description Text (215):
Suppose here that the resource manager judges that the requested resources can be used. As is the case with the first embodiment, the resource manager generates the key information based on the resource request information, and links the key information with the resource management information by adding the key ID of the generated key information to the resource management information. Then, the resource manager sends a key ID notification 6002 to the digitizer AP. Here, the contents stored in the resource management DB are shown in FIG. 41.

Detailed Description Text (216):
FIG. 41 shows contents stored in the resource management DB immediately after the request for the plurality of resources has been accepted. As shown in this figure, sets of resource management information 6601 to 6605 are respectively associated with the CODEC, the switch 114, the MIX circuit 115, the D/A converter 116, and the A/D converter 117. These sets of resource management information 6601 to 6605 are respectively linked with sets of key information 6611 to 6615. As can be understood, the resource management information and the key information linked together have the same key ID.

Detailed Description Text (217):

Upon receiving the key ID notification from the resource manager, the digitizer AP gains access to each of the resources via servers and uses the resources after initializing information necessary for the resources. Accordingly, the digitizer AP executes the recording process and the preview process.

Detailed Description Text (218):
Here, if receiving an instruction from the user to stop the preview process, the digitizer AP releases the MIX circuit 115 and the D/A converter 116 that are needed only for the preview process. The digitizer AP also sends a some-resources release notification 6003 including some-resources release information 6700 to the resource manager.

Detailed Description Text (219):
The some-resources release information 6700 included in the some-resources release notification 6003 is explained with reference to FIG. 42. FIG. 42 shows an example of a data construction and contents of the some-resources release information 6700 that is referred to when some of the resources having been acquired at one time are released.

Detailed Description Text (220):
As shown in this figure, the some-resources release information 6700 includes a client ID 6701, a key ID 6702, an object resource ID 6703, and a number of released resources 6704.

Detailed Description Text (221):
The client ID 6701 indicates an ID of an application program that releases some of the resources that the program acquired at one time. The key ID 6702 indicates the key ID that was notified by the resource manager in response to the resource use request for a plurality of resources. The object resource ID 6703 indicates an ID specifying the released resource. The number of released resources 6704 indicates the number of resources that have been released. The contents of the some-resources release information 6700 shown in FIG. 42 shows that the MIX circuit 115 and the D/A converter 116 have been released.

Detailed Description Text (222):
Upon receipt of the some-resources release notification 6003, the resource manager refers to the some-resources release information 6700 and deletes each set of the key information that is linked with the resource management information related to the released resources, so that the resource management information is updated. As a result, each set of resource management information related to the MIX circuit 115 and the D/A converter 116 is not linked with the corresponding key information.

Detailed Description Text (223):
In the present example case, the user activates the editor AP after the digitizer AP has suspended the preview process. Note that the digitizer AP continues to be operational after the activation of the editor AP. The activated editor AP sends the resource manager a resource use request 6004 including the resource request information that requests for the CODEC 112 or 113, the MIX circuit 115, and the D/A converter 116.

Detailed Description Text (224):
Upon receiving the resource use request 6004, the resource manager refers to the resource request information and the resource management DB, and performs the resource use request receiving process (see in FIG. 8). The resource manager generates the key information based on the resource request information, and links the key information with the resource management information by adding the key ID of the generated key information to the resource management information. Then, the resource manager sends a key ID notification 6005 to the editor AP. Here, the contents stored in the resource management DB are shown in FIG. 43.

Detailed Description Text (225):
FIG. 43 shows contents stored in the resource management DB in a case where the editor has been activated after the digitizer AP had suspended the preview process.

Detailed Description Text (226):
With this state, suppose that the user instructs the editor AP to terminate the execution. In response to the instruction from the user, the editor AP releases all the resources that have been used in the execution and sends a resource release completion notification 6006 including the key IDs to the resource manager.

Detailed Description Text (227):
Upon receipt of the notification 6006, the resource manager deletes all sets of the key information specified by the notified key IDs from the resource management information it and so updates the resource management information.

Detailed Description Text (228):
Next suppose here that, after the editor AP has finished its operation, the user instructs the digitizer AP to resume the preview process. The digitizer AP sends a resource use repeat request 6007 including resource repeat request information 6800 to the resource manager. The resource repeat request information 6800 indicates that the digitizer AP requests for the MIX circuit 115 and the D/A converter 116 required for the preview process in addition to the resources currently allocated to the digitizer AP.

Detailed Description Text (229):
FIG. 44 shows an example of a data construction and contents of the resource repeat request information 6800 that is referred to when some resources are needed in addition to the resources having been acquired at one time. As shown in this figure, the resource repeat request information 6800 includes a client ID 6801, a key ID 6802, an object resource ID 6803, and a number of requested resources 6804.

Detailed Description Text (230):
The client ID 6801 indicates an ID of an application program that requests for the resources that were released for the interruption operation. The key ID 6802 indicates the key ID that was notified by the resource manager in response to the resource use request for a plurality of resources. The object resource ID 6803 indicates an ID specifying the requested resource. The number of requested resources 6804 indicates the number of resources that are requested by the present application program.

Detailed Description Text (231):
Upon receiving the resource use repeat request 6007, the resource manager judges whether the requested resources can be allocated, by referring to the resource repeat request information 6800 and the resource management DB. If judging so, the resource manager generates the key information including the key ID that is indicated in the resource repeat request information, and links the key information with the resource management information by adding the key ID of the generated key information to the resource management information. Then, the resource manager sends the digitizer AP a request judgement notification 6008 that the requested resources can be used. If the resource manager judges that the requested resources cannot be allocated, the digitizer AP receives the request judgement notification that indicates so. Here, the contents stored in the resource management DB are as shown in FIG. 43 once again.

Detailed Description Text (232):
By means of the resource management system of the fifth embodiment, an application program can obtain authorization to use a plurality of resources at one time. As a result, deadlock, where the application program has to wait for another application to finish using the resources, can be prevented. Additionally, after obtaining authorization to use resources, the application program can release some of the acquired resources and re-acquire the once-released resources.

Detailed Description Text (234):
In the first and fifth embodiments, the procedures for sending/receiving messages among the resource manager, the clients, and the servers and the procedures for the resource use request receiving process have been described. However, these procedures may be recorded as computer programs in record media so that the programs can be executed by a general purpose computer or a household electrical appliance that has a function of executing a computer program. Alternatively, these recorded programs may be distributed via, for example, various kinds of communication channels.

Detailed Description Text (235):
The construction of the digital video reproducing/recording apparatus is shown in FIG. 20, FIG. 31, and FIG. 35 in the second to fourth embodiments. However, a computer program that has the same functions as the hardware controlling unit and the hardware resource managing unit may be recorded in a record medium and be distributed via, for example, various kinds of communication channels.

Detailed Description Text (236):
As such a record medium, an IC card, an optical disk, a flexible disk, or a ROM may be used. The distributed computer program may be installed in a household electrical appliance that has a function of executing a computer program or in a personal computer. After the installation, the appliance or the personal computer can execute the computer program so as to realize the function related to the resource management and the function as a digital video reproducing/recording apparatus as described in the preceding embodiments.

CLAIMS:

2. The digital video reproducing/recording apparatus of claim 1, wherein, in the digital video reproducing process, the encoded video data stored in the storing means is decoded either by the first and second CODECs or only by the second CODEC, the decoded video data is mixed by a mixing circuit, and the mixed data is converted into analog video by a D/A converter, wherein, in the digital video recording process, analog video is converted into digital video data by an A/D converter, the digital video data is encoded by the first CODEC, and the encoded digital video is stored in the storing means, wherein the retaining means retains information showing a current use state for each CODEC, each current use state showing whether the corresponding CODEC is being used, and wherein the judging means includes: a selecting unit for selecting at least one CODEC from the first and second CODECs in accordance with the process requested by the user; and an allocation judging unit for judging whether each CODEC selected by the selecting unit is available to the requested process, by referring to the information retained in the retaining means.

3. The digital video reproducing/recording apparatus of claim 2, wherein the retaining means retains a process name of either the digital video reproducing process or the digital video recording process, for each CODEC that is currently being used, wherein the request receiving means further receives maximum and minimum numbers of CODECs to be used in the requested process, the maximum number indicating a preferred number of CODECs required for the requested process and the minimum number indicating a lowest number of CODECs required for the requested process, and wherein the allocation judging unit includes: a first notifying unit for notifying, when a number of CODECs equal to the maximum are indicates as being "unallocated" by the retaining means, the execution controlling means that the maximum number of CODECs are available for allocation to the requested process; and a second notifying unit for notifying, when the number of CODECs indicated as being "unallocated" is below the maximum number but at least equal to the minimum number, the execution controlling means that the minimum number of CODECs are available for allocation to the requested process.

4. The digital video reproducing/recording apparatus of claim 3, wherein the allocation judging unit includes: a release requesting unit for requesting the execution controlling means, when a number of CODECs equal to the minimum are indicated as being "allocated" and this minimum number of CODECs are judged to be available to the requested process if a number of CODECs used in a currently-executed process is changed to the minimum number for the currently-executed process, to release the minimum number of CODECs for the requested process; and a third notifying unit for notifying, when the execution controlling means has released the minimum number of CODECs for the requested process, the execution controlling means that the minimum number of CODECs for the requested process is available for allocation to the requested process.

5. The digital video reproducing/recording apparatus of claim 2, wherein the retaining means includes: an unallocated hardware resource retaining unit for retaining information about each CODEC that is currently unallocated; an allocated hardware resource retaining unit for retaining information about each CODEC that is currently allocated; a first moving unit for moving the information about each CODEC that is judged by the allocation judging unit to be allocated to the requested process, from the unallocated hardware resource retaining unit into the allocated hardware resource retaining unit; and a second moving unit for moving, when receiving a notification that at least one of the first and second CODECs has been released, the CODEC from the allocated hardware resource retaining unit into the unallocated hardware resource retaining unit, wherein the allocation judging unit authorizes allocation of each CODEC selected by the selecting unit when the information about the CODEC is retained in the unallocated hardware resource retaining unit.

6. The digital video reproducing/recording apparatus of claim 5, wherein the request receiving means further receives maximum and minimum numbers of CODECs to be used in the requested process, the maximum number indicating a preferred number of CODECs required for the requested process and the minimum number indicating a lowest number of CODECs required for the requested process, and wherein the allocation judging unit includes: a first notifying unit for notifying, when a number of CODECs equal to the maximum are retained in the unallocated hardware resource retaining unit, the execution controlling means that the maximum number of CODECs are available for allocation to the requested process; and a second notifying unit for notifying, when the number of CODECs retained in the unallocated hardware resource retaining unit is below the maximum number but a number of CODECs retained in the unallocated hardware resource retaining unit is at least equal to the minimum number, the execution controlling means that the minimum number of CODECs for the requested process are available for allocation.

7. The digital video reproducing/recording apparatus of claim 6, wherein the first moving unit writes a name of the requested process into the allocated hardware resource retaining unit when moving each CODEC allocated to the requested process from the unallocated hardware resource retaining unit into the allocated hardware resource retaining unit, wherein the allocation judging unit includes: a release requesting unit for requesting the execution controlling means, when a number of CODECs equal to the minimum required for the requested process is retained in the allocated hardware resource retaining unit and this minimum number of CODECs are judged to be available for allocation to the requested process if a number of CODECs used in a currently-executed process is changed to the minimum number for the currently-executed process, to release the minimum number for the requested process; and a third notifying unit for notifying, when the execution controlling means has released the minimum number of CODECs for the requested process and the second moving unit moves each released CODEC from the allocated hardware resource retaining unit into the unallocated hardware resource retaining unit, the execution controlling means that the minimum number of CODECs for the requested process are available for allocation to the requested process.

8. The digital video reproducing/recording apparatus of claim 2, wherein the retaining means includes: an unallocated hardware resource retaining unit for retaining information for each CODEC that is currently unallocated; a deleting unit for deleting the information about each CODEC that is judged by the allocation judging unit to be available to the requested process, from the unallocated hardware resource retaining unit; a writing unit for writing, when receiving a notification that each allocated CODEC has been released, the CODEC into the unallocated hardware resource retaining unit, wherein the allocation judging unit authorizes allocation of each CODEC to the requested process when the CODEC is retained in the unallocated hardware resource retaining unit.

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L18: Entry 1 of 2 File: PGPB Mar 7, 2002

DOCUMENT-IDENTIFIER: US 20020029224 A1
TITLE: Method for transferring information

Abstract Paragraph:
A method of updating local map displaying databases of a distributed database via a broadcasting system with a transfer capacity. In a first step it is determined what information the distributed database needs to be updated with. In a second step the information is arranged according to a priority scheme. In a third step the information is transferred to the local map displaying databases via the broadcasting system according to the priority scheme and in dependence of the transfer capacity of the broadcasting system.

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Summary of Invention Paragraph:
[0001] The present invention relates generally to a method of information transfer, for example an electronic map, additional information related to an electronic map multimedia applications or the like, in a bandwidth efficient manner with one or more radiofrequency receivers such as mobile, portable, and stationary radiofrequency receivers.

Summary of Invention Paragraph:
[0003] Further map display systems may be found in JP 10-255022 and EP 786646. The abstract of JP 10-255022 describes a car navigation device that receives map data updates by means of a mobile telephone. EP 786646 describes a vehicle navigation system that may be updated with map data by physically collecting updates in the form of a PC-card from special locations. U.S. Pat. No. 5,684,989 discloses that the updating of information in a local terminal can be carried out at a specified time when the local terminal is idle, but said document relates primarily to the management of database information at the local terminal. It does not disclose or suggest a scheme for managing the transfer of information from the central host to the local terminal.

Summary of Invention Paragraph:
[0006] Another object of the invention is to define a method which is able to transfer to an information consumer supplemental information relating to primary information contained by the information consumer.

Summary of Invention Paragraph:
[0007] A further object of the invention is to define a method for transferring information to one or more information consumers in an efficient manner without using more bandwidth than necessary of the transferring system.

Summary of Invention Paragraph:
[0010] The aforementioned objects are achieved according to the invention by a method of updating local map displaying databases of a distributed database via a transfer system with a transfer capacity. The transfer capacity of the transfer system is limited and can in some cases be relatively small. The method comprises a number of steps. In a first step it is determined what information, preferably additional information, the distributed database needs to be updated with. In a second step the information is arranged according to a priority scheme. In a third step the information is transferred to the local map displaying databases via the transfer system according to the priority scheme and in dependence of the transfer capacity of the transfer system.

Summary of Invention Paragraph:

[0011] The method can advantageously further comprise the step of formatting the information and whereby in the second step of arranging the information according to a priority scheme, the formatting of the information is taken into account. In some versions of the invention the step of formatting the information comprises tagging the information with a start time of availability thereby enabling a local map displaying database to hide the received tagged information until the time of availability. In some versions the step of transferring the information transfers the information ahead of the tagged start time of availability thereby enabling a more even transfer load on the transfer system. Advantageously the step of formatting the information comprises tagging the information with a stop time of availability thereby enabling a local map displaying database to discard the information after the stop time of availability thus saving storage in the local database. Another advantage is that a command for discarding/deleting the information does not have to be transferred thus saving bandwidth. Preferably then also the step of transferring the information does not transfer the information after the tagged stop time of availability or a predetermined time before the tagged stop time of availability thereby avoiding the transfer of obsolete or nearly obsolete information. The step of formatting the information can also advantageously comprise tagging the information with an identification thereby enabling the local map displaying database to determine if the information is already present or not. Preferably the step of transferring the information comprises transferring the information more than one time thereby ensuring to a higher degree that a local map displaying database becomes updated.

Summary of Invention Paragraph:
[0012] The method can preferably also comprise the step of determining to what extent the information should be transferred via the transfer system. The step of transferring the information will then preferably do so in accordance with the step of determining to what extent the information should be transferred, thereby enabling a lower transfer load on the transfer system. To what extent encompasses if the information should be repeatedly transferred or not, and if so how many times, it can also preferably encompass only transferring the information in parts of the transfer system, the information thus not reaching all the local map displaying databases of the distributed database reachable via the transfer system. For example, users located in one city might not be interested in menus of restaurants located in another city far away, it is thus unnecessary to provide these users with the menus.

Summary of Invention Paragraph:
[0013] The information transfer system is advantageously an available broadcasting system such as either an analog type, for example ordinary analog radio such as FM-radio using subcarrier technology to transfer the information, or a digital type, for example digital audio broadcasting (DAB) primarily used for radio or digital video broadcasting (DVB) which is primarily used for TV. The information is advantageously supplemental/additional information that relates to geographical information contained in the map displaying system, the supplemental/additional information being more volatile/changeable than the geographical information contained in the map displaying system.

Summary of Invention Paragraph:
[0014] The aforementioned objects are also achieved by a method of transferring information from an information provider to a map displaying system. The transfer is accomplished by means of a broadcasting system with a transfer capacity to a receiver of the rap displaying system. Thereby an efficient information transfer when a demand to transfer information to the map displaying system is originated by the information provider is enabled. According to the invention the method comprises a number of steps. In a first step the information provider establishes contact with an information transfer point for requesting transfer of information to the map displaying system. In a second step the information transfer point receives the information from the information provider. In a third step the information transfer point formats the received information. In a fourth step the information transfer point arranges the formatted information in a priority scheme based on the formatting. In a fifth step the information transfer point, based on the priority scheme and the transfer capacity of the broadcasting system, transfers the formatted information over the broadcasting system to the receiver of the map displaying system to thereby transfer information from the information provider to the map displaying system in an efficient manner. Advantageously the third step of formatting the received information comprises tagging the information with a start time of availability thereby enabling a map displaying system receiving the information to hide the received tagged information until the time of availability. The fifth step of transferring the formatted information then can preferably transfer the information ahead of the tagged start

time of availability thereby enabling a more even transfer load on the broadcasting system.

Summary of Invention Paragraph:
[0015] The third step of formatting the information can advantageously comprise tagging the information with a stop time of availability thereby enabling a map displaying system receiving the tagged information to discard the information after the stop time of availability thus saving storage in the map displaying system. Another advantage is that a command for discarding/deleting the information does not have to be transferred thus saving bandwidth. Preferably then the fifth step of transferring the formatted information does not transfer the information after the tagged stop time of availability or a predetermined time before the tagged stop time of availability thereby avoiding the transfer of obsolete information.

Summary of Invention Paragraph:
[0017] Advantageously the method further comprises the step of determining to what extent the formatted information should be transferred via the broadcasting system. The fifth step of transferring the formatted information will then transfer the information in accordance with the determination to what extent the information should be transferred by determining over which transmitter or transmitters the transfer should take place thereby enabling a lower transfer load on the broadcasting system.

Summary of Invention Paragraph:
[0018] The broadcasting system is preferably of either an analog type, for example ordinary analog radio such as FM-radio using subcarrier technology to transfer the information, or a digital type, for example digital audio broadcasting (DAB) primarily used for radio or digital video broadcasting (DVB) which is primarily used for TV. The information is advantageously supplemental/additional information that relates to geographical information contained in the map displaying system, the supplemental/additional information being more volatile/changeable than the geographical information contained in the map displaying system.

Summary of Invention Paragraph:
[0019] The aforementioned objects are also achieved according to the invention by a method of in a map displaying system receiving information pertaining to the map displaying system via a wireless transfer system. The method comprises a number of steps. In a first step information transferred via the wireless transfer system is received by means of a receiver. In a second step the received information is decoded. In a third step, if the decoded information is tagged with a start time of availability, a comparison of the start time of availability with a current time is performed and it is determined that the information is to be hidden until the current time is equal to or later than the start time of availability. Optionally there is a determination after the second step and before the third step which determines if the information is tagged with a start time of availability. And finally in a fourth step only such information which is not determined to be hidden is made available and possibly displayed.

Summary of Invention Paragraph:
[0023] The wireless transfer system is advantageously an available broadcasting system such as either an analog type, for example ordinary analog radio such as FM-radio using subcarrier technology to transfer the information, or a digital type, for example digital audio broadcasting (DAB) primarily used for radio or digital video broadcasting (DVB) which is primarily used for TV. The information is advantageously supplemental/additional information that relates to geographical information contained in the map displaying system, the supplemental/additional information being more volatile/changeable than the geographical information contained in the map displaying system.

Summary of Invention Paragraph:
[0024] The aforementioned objects are also achieved according to the invention by a map displaying system receiving information pertaining to the map displaying system via a wireless transfer system. According to the invention the map displaying system comprises a receiver, a decoder, a comparator and a display. The receiver receives information transferred via the wireless transfer system. The decoder decodes the received information. The comparator, if the decoded information is tagged with a start time of availability, compares the start time of availability with a current time and determines that the information is to be hidden until the current time is equal to or later than the start time of availability. And the display makes available and displays only such information which is not determined to be hidden.

Summary of Invention Paragraph:
[0025] By providing a method for transferring information from an information provider to an information consumer in the form of a map displaying system via a wireless transfer network, preferably a broadcasting network, a plurality of advantages over prior art systems are obtained. A primary purpose of the invention is to save bandwidth, i.e. allowing a user of a map displaying system to be under the impression that a virtually direct on-line connection exists between the user's local map displaying system and a central database, with only a very limited bandwidth actually being available between the central database and the local map displaying system. According to the invention this is achieved primarily by cutting the peaks (of the desired transmission capacity), i.e. having a continuous fairly low transmission rate instead of having periods with extremely high transmission rates (which transmission rates a system then has to be designed for) with long periods of no transmission at all. This allows the use of transmission systems wish fairly low transmission rates, such as subcarrier transmission (i.e. of the Radio Data System type) in an analog radio broadcasting system, as long as the transmission rate is equal or greater than the average of the necessary transmission rate. A priority scheme of the information will allow this. A further configuration of the invention tags the information to be transmitted with a start time of availability, i.e. a tine before which a user of a map displaying system should not have access to or even be aware of the information. This in combination with map displaying systems that hides the tagged information until time and date is equal to or has passed the start time of availability allows the tagged information to be transmitted at any arbitrary time, preferably but not necessarily before the start time of availability. This will anyway allow the user to believe that the information is received and made available simultaneously. Other types of tags will even further decrease the necessary transmission rate, or allow more information to be transmitted with the same transmission rate. Other advantages of this invention is that obsolete information is automatically removed from the local map displaying systems by means of a stop time of availability tag. In some configurations the information is not transmitted ever the complete broadcasting system but only selected parts which also saves bandwidth.

Brief Description of Drawings Paragraph:
[0028] FIG. 2 shows a block diagram of an information transfer system according to the invention,

Detail Description Paragraph:
[0031] The invention concerns problems associated with information transfer, specifically the transfer of additional/supplemental information to map displaying systems. It is a desire of users of map displaying systems to have access to a continuously updated database. However, it could be considered to be unpractical to be continuously connected to a central database containing all the maps and additional information that one could possibly want to access. One method of providing users/information consumers with easy access to desired maps and still be mobile or portable, i.e. not hooked up to a central database, is to provide each user with his or her own database comprising all the necessary information. However, it could be considered to be a disadvantage that the local database is fixed and that it is difficult to up-date the database by a new database. Users would not have access to volatile information such as road accidents, road construction work, hotel occupancy, meal of the day or menu at different restaurants, the current movies at cinemas, current advertisements and so on.

Detail Description Paragraph:
[0032] In a map displaying system according to the invention the information consumers/users have a local database comprising primary information, for example road maps and other types of information that does not change very often. Additionally volatile information, i.e. additional and/or supplemental information of a non-permanent nature, is transferred from one, or more, central databases, information providers, to the users for automatic updating of their local databases. The invention enables this updating of a distributed database in an efficient manner even when the desired information flow/rate temporarily surpasses the instantaneous capacity of the transfer system. According to the invention, information that is to be made available to an information consumer at a predetermined time can be transferred through the transfer system at a for the transfer system suitable time, i.e. when the transfer system has capacity, and be made available to the information consumer first at the predetermined time.

Detail Description Paragraph:
[0037] According to the invention these different types of information are coded in dependence of their type to put as an even load as possible on the transfer system and also not to put an

unreasonable load on the local databases and their available storage facilities. This is possible by a priority scheme that in a temporal manner distributes the transfer of information around the clock, thus allowing the use of a transfer system that has a much lower peak capacity than the expected peak loads of desired information transfer. The priority scheme is based on the urgency, the required availability time, the availability of the information before a demanded availability of the information to the users etc. This can be controlled in some manner by pricing, higher priority information is more expensive to transfer and information that is available a long time before a user must have or is allowed access to the information is cheaper to transfer.

Detail Description Paragraph:
[0038] The type of information that a user is allowed to have access to only from a specific time (and date) has traditionally caused problems in transferring such information since it tends to cluster around certain time periods and if all the information was to be transferred at the exact instance the information should be available, then a transfer system with an almost unlimited bandwidth is necessary to provide this service. Fortunately a lot of this type of information is available long before a user is allowed access to it. According to the invention information of this type is coded with a time (and date) when a user will get access to it independently of when the information was transferred. The receiving map displaying system will keep the information in storage and invisible to the user until the time arrives that the user is allowed to have access to the information, first then is it made available to the user accessible parts of the map displaying system. Most information is also advantageously coded with an ending or erasing time (and date) after which it is removed from the local system storage and thus not available any more. Information that is not provided with an ending time can be removed by commands transferred that tell the map displaying system to remove the information. To be able to facilitate the identification and thus processing of the different information blocks, according to the invention each information block is uniquely identified with a unique identification such as a unique number.

Detail Description Paragraph:
[0039] The information transfer system is advantageously an available broadcasting system such as an analog (FM) or digital audio or video broadcasting systems (DAB/DVB) which has the ability to transfer information. In an analog broadcasting system, for example FM-radio, information can be transferred by means of subcarrier technology such as that used for radio data system (RDS). However, the advantages of the invention are equally well attained when a point to point transfer system is used.

Detail Description Paragraph:
[0040] FIG. 2 shows a block diagram of one embodiment of an information transfer system according to the invention. As indicated in the figure and below, certain parts can form smaller or larger groups. The information that is to be transferred to an information consumer/map displaying system 290 can be found at an information/content provider 200. The other parts that make up the system are an information transfer point/a service provider 210 with an associated database 220, a broadcasting network/a network provider 240 with associated transmission cells 245, 246, 247, a further transfer network 230, an information consumer/map displaying system 290 with, for example a FM or a DAB (or other appropriate) receiver 291 and a map display and processing system 292 and optionally moans 299 for receiving/calculating the position of the map displaying system 290, for example by means of a GPS (Global Positioning System) receiver.

Detail Description Paragraph:
[0041] The invention is not dependent on the exact physical closeness of the different parts, logically the information consumer 290 is preferably apart from the other parts 200, 210, 220, 230, 240 of the system. For example the information transfer point 210 might be part of the information provider 200, or form part with the information database 220 and the broadcasting network/system 240, or be a completely independent service. As mentioned there are many possibilities, but they do not affect the invention.

Detail Description Paragraph:
[0042] Basically the invention provides a map displaying system 290 in an extremely efficient manner with the appearance of being on-line with a central information database. The invention preferably utilizes a broadcasting system 240 for transfer of information to the information consumer 290. A broadcasting system is very effective in transferring information to many

receivers. Sometimes a broadcasting system is referred to as a point to multi point transfer system. A customary manner to transfer information to (and from) a single recipient is to use a so called point to point transfer system. A common disadvantage with a point to point system is that it is very expensive per unit of transferred information.

Detail Description Paragraph:
[0043] To further lower the transfer load different information can be transferred in the different cells 245, 246, 247. Preferably part of the transferred information is common and part of the information is only transferred in one or more cells or regions 245, 246, 247, i.e. the extent of the transfer can be decided. By charging for the area coverage, some advertisers might feel that it is uneconomical to pay for the transfer of advertisements to, for example, a whole country when the content only has very local interest. A user located in a first region might not be very interested in an advertisement being only of interest in a second region different from the first region. A DAB system can be of a SFN (Single Frequency Network) nature, be of a more traditional radio broadcasting nature with different frequency regions/cells 245, 246, 247 or a combination of both where there can be a SFN covering a nation or large region and also several different DAB frequency regions within the same coverage area, each of which can be a small SFN system. It is possible to direct and send different information within a SFN as well as in the traditional cell structure. Sending different information in a SFN requires great care, but is possible. An analog broadcasting system uses different frequencies in neighboring cells and is thus capable of transmitting different information in different "cells".

Detail Description Paragraph:
[0044] FIG. 3 shows a flow chart of a method according to the invention for transmitting additional information to the information consumers/map displaying system via, for example, a broadcasting system. In a first step 300 it is determined if there is any information to transfer to the local map displaying systems. When there is something to transfer the information in question is coded in a second step 310 with a priority which, for example, can be based on an earliest time of allowable access. The information can advantageously also be coded with an earliest time of allowable access and possibly an end/erase time. Optionally it is determined if the information is to be transferred only in certain regions or in the complete system in first optional step 312. If the information is to be prepared to be transferred in the whole system this is done in a second optional step 314. On the other hand if the extent of the transfer of the information is limited, i.e. the information is only to be transferred in parts of the system then it is prepared for this in a third optional step 316. It is then determined in a third step 320 if there is capacity/bandwidth available in the transfer system in dependence on the set priority. When there is capacity according to the priority the information is transferred in a fourth step 330. The procedure will continue with the first step 300 unless there is a fourth optional step 332 to determine if there should be performed a retransmission of the information or not. If there should be performed a retransmission then preferably there is a delay in a fifth optional step 334 before the procedure continues to the third step 320. If there should not be performed any retransmission of the information, the information is obsolete, or if enough retransmissions have been performed then the procedure advantageously continues with the first step 300.

Detail Description Paragraph:
[0057] 210 information transfer point

Detail Description Paragraph:
[0072] 314 optional: yes, prepare for total transfer

Detail Description Paragraph:
[0073] 316 optional: no, prepare for selected areas/transfer means

Detail Description Paragraph:
[0074] 320 is bandwidth/transmission capacity available, possibly in view of priority?

Detail Description Paragraph:
[0075] 330 transmit/transfer information

Detail Description Paragraph:
[0077] 334 optional: if yes then it is suitable with a delay before next transfer/transmission

CLAIMS:

1. A method of updating local map displaying databases of a distributed database via a transfer system with a transfer capacity, characterized in that the method comprises the following steps in an information transfer point: determining (300) what information the distributed database needs to be updated with; arranging the information according to a priority scheme which in a temporal manner distributes the transfer of information; transferring (330) the information to the local map displaying databases via the transfer system according to the priority scheme and in dependence of the transfer capacity of the transfer system.

4. The method according to claim 3, characterized in that the step of transferring (330) the information transfers the information ahead of the tagged start time of availability thereby enabling a more even transfer load on the transfer system.

6. The method according to claim 5, characterized in that the step of transferring (330) the information does not transfer the information after the tagged stop time of availability or a predetermined time before the tagged stop time of availability thereby avoiding the transfer of obsolete or nearly obsolete information.

9. The method according to claim 1 characterized in that the method further comprises the following step: determining (312) to what extent the information should be transferred via the transfer system; and in that the step of transferring the information does so in accordance with the determining to what extent the information should be transferred, thereby enabling a lower transfer load on the transfer system.

10. The method according to claim 1 characterized in that the transfer system is a broadcasting system.

14. A method of transferring information from an information provider to a map displaying system, by means of a broadcasting system with a transfer capacity to a receiver of the map displaying system, to thereby enable an efficient information transfer when a demand to transfer information to the map displaying system is originated by the information provider, characterized in that the method comprises the following steps: the information provider establishing contact with an information transfer point for requesting transfer of information to the map displaying system; the information transfer point receiving the information from the information provider; the information transfer point formatting (310) the received information; the information transfer point arranging the formatted information in a priority scheme, that in a temporal manner distributes the transfers based on the formatting; the information transfer point, based on the priority scheme and the transfer capacity of the broadcasting system, transferring (330) the formatted information over the broadcasting system to the receiver of the map displaying system to thereby transfer information from the information provider to the map displaying system.

16. The method according to claim 15, characterized in that the step of transferring (330) the formatted information transfers the information ahead of the tagged start time of availability thereby enabling a more even transfer load on the broadcasting system.

18. The method according to claim 17, characterized in that the step of transferring (330) the formatted information does not transfer the information after the tagged stop time of availability or a predetermined time before the tagged stop time of availability thereby avoiding the transfer of obsolete information.

21. The method according to claim 14 characterized in that the method further comprises the following step: determining to what extent (312, 314, 316) the formatted information should be transferred via the broadcasting system; and in that the step of transferring the formatted information does so in accordance with the determination to what extent the information should be transferred by determining over which transmitter or transmitters the transfer should take place thereby enabling a lower transfer load on the broadcasting system.

25. A method of in a map displaying system receiving information pertaining to the map displaying system via a wireless transfer system, characterized in that the method comprises the following steps: receiving (400) information transferred via the wireless transfer system

by means of a receiver; decoding (410) the received information; if the decoded information is tagged with a start time of availability, then comparing (460) the start time of availability with a current time and determining that the information is to be hidden until the current time is equal to or later than the start time of availability; making available and displaying (470) only such information which is not determined to be hidden.

32. A map displaying system (292) receiving information pertaining to the map displaying system via a wireless transfer system, characterized in that the map displaying system comprises: a receiver (291) for receiving information transferred via the wireless transfer system; a decoder (292) for decoding the received information; a comparator (292) which if the decoded information is tagged with a start time of availability, compares the start time of availability with a current time and determines that the information is to be hidden until the current time is equal to or later than the start time of availability; a display (100) which makes available and displays only such information which is not determined to be hidden.

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☐ 1. Document ID: US 20020029224 A1

L17: Entry 1 of 3 File: PGPB Mar 7, 2002

PGPUB-DOCUMENT-NUMBER: 20020029224
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DOCUMENT-IDENTIFIER: US 20020029224 A1

TITLE: Method for transferring information

PUBLICATION-DATE: March 7, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Carlsson, Frederik	Lulea		SE	

US-CL-CURRENT: 707/104.1; 701/209, 707/10, 707/200, 709/219, 709/232

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. Desc | Image

☑ 2. Document ID: US 5649168 A

L17: Entry 2 of 3 File: USPT Jul 15, 1997

US-PAT-NO: 5649168
DOCUMENT-IDENTIFIER: US 5649168 A

TITLE: Computer program product for a query pass through in a heterogeneous distributed data base environment

DATE-ISSUED: July 15, 1997

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
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Wang; Yun	Saratoga	CA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
International Business Machines Corporation	Armonk	NY			02

APPL-NO: 08/ 475841 [PALM]
DATE FILED: June 7, 1995

PARENT-CASE:
This application is a division of application Ser. No. 08/310,799, filed Sep. 29, 1994 (status: pending).

INT-CL: [06] G06 F 13/14, G06 F 15/16

US-CL-ISSUED: 395/500; 395/612, 395/613
US-CL-CURRENT: 703/23; 707/101, 707/104.1

FIELD-OF-SEARCH: 395/500, 395/600, 395/612, 395/613, 395/614, 395/616, 364/282.1, 364/282.4, 364/283.3, 364/260

PRIOR-ART-DISCLOSED:

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ART-UNIT: 234

PRIMARY-EXAMINER: Teska; Kevin J.

ASSISTANT-EXAMINER: Walker; Tyrone V.

ATTY-AGENT-FIRM: Kappos; David J. Sterne, Kessler, Goldstein & Fox, P.L.L.C.

ABSTRACT:

A system and method of pass through in a heterogeneous distributed database environment allows a client to specify syntax that is only understood and processed by a database instance of a back-end server even if it is not understood by an interface module. A hybrid pass through feature provides a combination of both a pass through mode and a native mode allowing statements to be passed through to the database instance or to be processed by the interface module. To accomplish this, a pass through session is established. The scope of the pass through session is defined by statements that establish and terminate the session. Rules determine whether dynamic statements are handled in pass through mode or in native mode based on whether the statements are within or outside of the scope of the pass through session. Input host variable support is provided to database instances that don't otherwise support host variables.

24 Claims, 4 Drawing figures

☐ 3. Document ID: WO 200026813 A2, US 20020029224 A1, AU 200014328 A, EP 1135734 A2

L17: Entry 3 of 3 File: DWPI May 11, 2000

DERWENT-ACC-NO: 2000-422525
DERWENT-WEEK: 200221

TITLE: Updating method of local map displaying database, involves transferring information to local map displaying database corresponding to set priority scheme, based on transfer capacity of transfer system

INVENTOR: CARLSSON, F

PRIORITY-DATA: 1998SE-0003745 (November 2, 1998)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
WO 200026813 A2	May 11, 2000	E	038	G06F017/30
US 20020029224 A1	March 7, 2002		000	G06F015/16
AU 200014328 A	May 22, 2000		000	G06F017/30
EP 1135734 A2	September 26, 2001	E	000	G06F017/30

INT-CL (IPC): G01 C 21/20; G01 C 21/32; G06 F 15/16; G06 F 17/30; G06 F 17/40; G08 G 1/01

ABSTRACTED-PUB-NO: US20020029224A
BASIC-ABSTRACT:

NOVELTY - The information to be updated in a distributed database, is determined and is arranged according to priority scheme. Then information is transferred to local map displaying database via transfer system, corresponding to set priority, based on transfer capacity of transfer system. The transferred information are then formatted.

DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for map displaying system.

USE - For updating local map displaying database of distributed database used for car navigation device, TV by transferring information through digital audio broadcasting.

ADVANTAGE - Transfers information to one or more information consumers in efficient manner without using more bandwidth. The formatted information is tagged with stop time enabling local map displaying database to discard information after stop time of availability, hence saves storage in local database. Saves bandwidth as command for discarding information need not be transferred.

DESCRIPTION OF DRAWING(S) - The figure shows maps of map displaying system.
ABSTRACTED-PUB-NO:

WO 200026813A EQUIVALENT-ABSTRACTS:

NOVELTY - The information to be updated in a distributed database, is determined and is arranged according to priority scheme. Then information is transferred to local map displaying database via transfer system, corresponding to set priority, based on transfer capacity of transfer system. The transferred information are then formatted.

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DESCRIPTION OF DRAWING(S) - The figure shows maps of map displaying system.

Term	Documents
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TRANSFERS	312297
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